Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Information literacy education during the pandemic: The cases of academic libraries in Chinese top universities

Jinchi Guo a,*, Jie Huang b

a East China Normal University Library, Shanghai 200062, China
b Pennsylvania State University Libraries, PA, USA

ARTICLE INFO

Keywords:
- Pandemic
- COVID-19
- Information literacy
- Academic library
- Social media

ABSTRACT

The outbreak of COVID-19 poses new challenges to information literacy education. Facing the worldwide pandemic, academic libraries in various countries are still exploring how to cope with the situation. Little research has been carried out on how academic libraries should systematically promote information literacy education during the pandemic. This study uses 42 academic libraries at the top universities in China as cases for content analysis, focusing on information literacy education via online mini-courses, lectures, and other online teaching methods. The study has found that information literacy education during the pandemic has several characteristics, such as rapid response to information needs, recommending reliable information resources to users, developing and gathering current information on COVID-19 cases, and resisting misinformation and false information. Although libraries act quickly to meet users’ needs in this new situation, they are still confronted with some problems, such as insufficient planning, untimely updates, incomplete resources, etc. This study suggests that libraries adopt the following approaches to the development of information literacy education under the new norm of the pandemic: boosting online courses with multi-platform linkage; developing innovative teaching models with online and offline combination; exploring teaching opportunities and expanding teaching content according to new information needs; fighting misinformation.

Introduction

The COVID-19 pandemic was a major worldwide public health emergency in 2020. It severely disrupted people’s daily lives around the world. Wuhan was the first city in China completely shut down on January 23, 2020. Other provinces in the country successively initiated Level I emergency response to the situation. On January 30, 2020, the World Health Organization (WHO) announced that the COVID-19 had constituted a public health emergency internationally (WHO, 2020b). In early February 2020, the WHO opened a column “Coronavirus disease (COVID-19) advice for the public” to help the public obtain accurate information and fight the misinformation and disinformation when the world faces the “infodemic” (WHO, 2020a; WHO, 2020c). In response to the spread of false information, the United Nations Educational, Scientific and Cultural Organization (UNESCO) in April 2020 also put up a column, called “Information Sharing & Countering Disinformation” on its website to promote media and information literacy and fight the false information (UNESCO, 2020a). From February to March 2020, all universities in China started their spring semester online. Wuhan was unlocked on April 8. Afterwards, other provinces also gradually ceased their Level I emergency response. In mid-May, some colleges and universities began to allow students to return to the campuses. In June, colleges and universities organized online examinations. Since the outbreak of the COVID-19, how have academic libraries in China carried out information literacy education to deal with the impact of the pandemic? This study aims to answer this question.

Literature review

Since the term information literacy was proposed by Paul Zurkowski in 1974, its connotation and denotation have been continuously extended (Zurkowski, 1974). With rapid changes of era and environment, information literacy education has also been constantly deepening and expanding. The Association of College and Research Libraries’ (ACRL) document, “Framework for Information Literacy in Higher Education,” states that “renewed vision of information literacy as an overarching set of abilities in which students are consumers and creators of information who can participate successfully in collaborative spaces”
improve the public out that the fundamental way to prevent the spread of rumors is to improve their information literacy education during the pandemic, the Library Society of China (LSC), the American Library Association’s (ALA) webpage “Pandemic Preparedness: Resources for libraries” and the ACRL’s “Pandemic Resources for Academic Libraries” guide deliver many reliable and authoritative information resources to guard against the spread of false information about the pandemic (ACRL, 2020; ALA, 2020). In order to help librarians improve their information literacy education during the pandemic, the ACRL has adopted various methods such as group discussion, online courses, and web seminars. The Library Society of China (LSC), the University Library Committee of the Ministry of Education, and the provincial and municipal library societies in China also organized online lectures to help librarians strengthen their capabilities of teaching information literacy and meeting the challenges resulted from the pandemic.

Besides the efforts made by library and information organizations and associations, a number of scholars also conducted research on library and information services in the middle of pandemic and put forward suggestions. Ke (2020) put forward ten suggestions on the mechanism of library and information services in public safety emergencies. Cai and Wu (2020) proposed some ideas on the emergency support system of information resources at academic libraries. Wang et al. (2020) studied the concept and ten characteristics of “misinformation pandemic”. Fighting the “misinformation pandemic” is the new focus of information literacy education now (S. Wang, 2020). Chen emphasized that overcoming the “misinformation pandemic” is the reflection of scientific and cultural quality, especially the quality of information literacy (Chen, 2020). Other professionals and scholars expressed the urgency and importance of information literacy education in response to major public health crisis around the world, and pointed out that the fundamental way to prevent the spread of rumors is to improve the public’s information literacy. Libraries can share authoritative and reliable information resources through websites or social media, and use the influence of their digital resources to combat fake news about the pandemic (Mokhtari & Mirzaei, 2020; Ostman, 2020; Wang et al., 2020). With a view to possible long-term online teaching and the uncertainty of entire society, Cook (2020) discussed digital information literacy, online learning, and how to apply fact-checking approaches and tools to online classrooms during the pandemic.

In addition to the library and information profession, scholars from medicine, informatics, communication, education and other disciplines have also stressed the importance of improving information literacy in the pandemic. The paper entitled “An Interim Review of Lessons from the Novel Coronavirus (SARS-CoV-2) Outbreak in China” states that the citizens’ civic quality and scientific literacy need to be improved urgently (Ding et al., 2020). The special article “COVID-19 & Misinfodemics” published in the “HKS Misinformation Review” by the Kennedy School of Harvard University analyzed the spread of false information about the pandemic and its impact on the public (Harvard Kennedy School, 2020). Scholars believe that facing so many diverse resources and a large amount of information about COVID-19 as the circumstances surrounding the pandemic continue to evolve, the ability to screen and retrieve effective information is an important manifestation of information literacy. They pointed out that the global public health crisis is also an information crisis. Educators should help the public and students improve their ability to identify false information in the crisis through information literacy education (Gu, 2020; Shi, 2020; Xie et al., 2020).

In summary, the current relevant studies have pointed out that people’s ability to identify real and authoritative information needs to be improved. They have also emphasized the importance of information literacy education in responding to the COVID-19 pandemic. However, the studies mainly stayed at the level of what it should be. Few of them discussed better approaches to developing and implementing information literacy education. There is also lack of relevant research on the practice of information literacy education in colleges and universities in the current health crisis.

Research methodology

Research object

This study collected data from 42 academic libraries in China from January 23 to July 23, 2020. All of 42 academic libraries reviewed and analyzed in this study are the libraries at the universities that are called “Double First-Class” (i.e. first-class universities and first-class disciplines) in China (Ministry of Education, 2017). These are top universities selected as participants in the Chinese government’s “Double First-Class” initiative, which aims to drive the improvement of the overall level of higher education in China and ultimately build a number of world-class universities and disciplines by the end of 2050 (Ministry of Education, 2015). ’Double First-Class’ universities receive more supports than other regular universities and colleges in terms of funding and resources. Therefore, their libraries represent a higher level than other academic libraries with more advanced equipment and better conditions. These libraries are also pioneers in the use of new technologies to provide information literacy education.

Research through Internet

This research adopted both Internet and mobile Internet approaches. The data and sample cases were collected from these 42 academic libraries’ websites, WeChat and Bilibili platforms in China in the half-year period mentioned above, including colleges’ winter break and spring semester in 2020.

Internet research:

The authors used the Internet to check both information literacy columns and the information related to information literacy education posted on these libraries’ websites. The information about creation and promotion of libraries’ WeChat official accounts and Bilibili accounts were also checked through libraries’ websites to find and confirm their WeChat official public accounts and Bilibili accounts;

Mobile Internet research:

The authors utilized mobile devices to search WeChat (APP) and Bilibili (APP) for each “Double First-Class” library’s WeChat official account and Bilibili account and followed them; The information released on libraries’ WeChat official accounts was checked every day. The libraries’ Bilibili official accounts and their websites were checked every week. The information related to information literacy education found on all accounts and websites were recorded according to different categories; The authors watched all open-to-the-public text-picture mini-courses and video mini-courses posted by the “Double First-Class”
libraries on both WeChat and Bilibili, as well as online lectures broadcasted live on the platforms such as Tencent Meeting.

The authors also read the information and reports on services provided by Chinese academic libraries in various provinces and cities across the country. These reports were published on the website of the Ministry of Education’s University Library Work Committee.

Recording data and cases

Due to college students' preference for social media and their surfing habits, plus the limitation on flexibility and accessibility of certain devices during the pandemic, libraries were most likely to use WeChat, which is the social media used by the most people on mobile devices in daily life, to publish and post various library information, including information literacy education. Since academic libraries use their WeChat accounts most frequently, each libraries' official account was checked every day during research period. Some libraries opened and used their accounts on the Bilibili, so those libraries' Bilibili accounts were checked every week. The information and messages on the libraries' websites were checked weekly as well because they were updated much less than those posted on the social media. All of information, messages and data checked and recorded were mainly about how quickly the “Double First-Class” libraries responded to the information literacy needs, the different teaching methods used, and the new content added to the information literacy education during the pandemic. In addition to the important data, some typical cases of information literacy education were recorded as well.

Research questions

This research intends to study the following issues of information literacy education during the pandemic through the analysis of statistical data and typical cases collected:

1. How quickly did the information literacy education respond to students’ information needs?
2. Which platforms were mainly used for the information literacy education to carry out online courses?
3. What were the main teaching methods used for the information literacy education?
4. What changes had been made to the content of information literacy education?
5. What were the characteristics of information literacy education?

Findings

In March 2020, the Chinese Ministry of Education issued the “Key Points of Education Informatization and Cybersecurity Work in 2020” (Ministry of Education, 2020b), It takes comprehensive improvement of information literacy as one of the important tasks for academic libraries. A few days later, the Ministry of Education published the “Guidelines on COVID-19 Prevention and Control in Higher Education Institutes”, which clearly states that college students should consciously screen and seek information through formal resources (Ministry of Education, 2020a).

The data collected showed that 42 “Double First-Class” academic libraries all provided information online services through library websites and social media platforms and information literacy education has been fully transformed into online teaching according to the government’s requirements and guidelines. The libraries took advantage of the convenience of the Internet and mobile applications to adopt flexible and diverse online teaching methods, mainly including mini-courses, online lectures and recorded videos. Four of those academic libraries (Sichuan University, Xiamen University, Nankai University, and East China Normal University) even created their official accounts on the new popular platform Bilibili and released videos on information literacy on there.

Mini-courses on information literacy

Mini-courses were online courses that had been well structured with a single goal and focused content (Su et al., 2014). They could be taught and learned in a short time. Mini-courses in our study were mainly divided into two types: video mini-courses, and text-picture mini-courses. Video mini-courses were usually 5–10 min long. The text-picture mini-courses had both text contents and pictures, but the texts generally ranged from 1000 to 2000 words.

During the pandemic, 95.2% of the “Double First-Class” academic libraries introduced different forms of mini-courses, and 52.8% of them had a series of mini-courses on information literacy.

Video mini-courses

21.4% of the “Double First-Class” academic libraries launched video mini-courses in the pandemic (see Table 1, sorted by their launch time). Among them, the “Information Mini-course” series offered by Zhejiang University Library were divided into three topics: finding out hotspots, benchmarking analysis, and good use of visualization. The “SJTU Mini-course” series of Shanghai Jiao Tong University Library were divided into resources, scientific research, patents, tools, and five other topics.

Apart from posting courses and videos on the libraries’ websites, Nankai University Library’s “Nankai Mini-course” was launched on the official account of the library on the Bilibili. The Southern China University of Technology Library started its mini-classroom of information literacy with a librarian’s personal account on the Bilibili as well.

In addition to original video mini-courses created by the libraries, Zhengzhou University Library and others purchased the “Information Literacy Tutorials Database for Higher Education” which contains more than one hundred video mini-courses, including nine topics: theories, technics, resources, systems, management, academics, writing, tools, and scenarios as part of their materials for the information literacy. The database was jointly built by librarians who taught the information literacy and database vendors. Librarians provided both course design and text content. Database vendors produced mini-course videos.

Text-picture mini-courses

45.2% of the “Double First-Class” academic libraries rolled out a series of text-picture mini-courses between January and July 2020 (see Table 2, sorted by their launch-time). For example, Peking University Library’s text-picture mini-course series called “One-Hour Online Training” was divided into three topics: database search, data literacy, and academic research. Beijing Normal University Library launched the text-picture “BNU Mini-course” in 2017. There were 44 lectures divided into 9 series before the pandemic. In February 2020, the library started its new version “Study during the Pandemic”, which contained 20 courses. The series was split into four topics: new method for off-campus search, treasure resources, Q&A on resources, and retrieval techniques. Half of the libraries which had this type of courses only offered non-

| Table 1 Video mini-courses. |
|-----------------------------|
| Academic library | Mini-course name | Lessons | Launch time |
| ZJU | Patent Mini-course | 12 | Feb. 2020 |
| SJTU | Information Mini-course | 12 | May 2020 |
| XJTU | SJTU Mini-course | 19 | Feb. to Jul. 2020 |
| TJU | Library Mini-course | 16 | Feb. to Jul. 2020 |
| SCUT | TJUL Mini-course | 10 | Mar. to May 2020 |
| NUDT | Library Mini Classroom | 6 | Mar. to May 2020 |
| NANKAI | Library Mini-course | 5 | Apr. to Jul. 2020 |
| ZLU | NANKAI Mini-course | 6 | Apr. to Jul. 2020 |
| SEU | Library Mini-course | 3 | Jun. to Jul. 2020 |
| SEU | SEU Mini-course | 2 | Jul. 2020 |
13.6% of libraries actually used live broadcast plus recording, 27.2% of teaching methods were used: live broadcast and recorded broadcast. Two main courses and text-picture mini-courses. Libraries launched their series of mini-courses which included both video series off-campus search and resource guides.

As the additional resources to the library’s official public account on WeChat, some librarians used their own personal accounts to engage in information literacy education, such as Wang Yuan’s “iSearchSearch” of the Tsinghua University Library, and Guo Jinchi’s “Mobile Information Literacy” at the East China Normal University Library. Both gave text-picture mini-courses on how to identify the authoritative information during the pandemic. The courses had a big impact on the users' search behavior.

Overall, only 4 libraries out of 42 “Double First-Class” academic libraries launched their series of mini-courses which included both video courses and text-picture mini-courses.

### Online information literacy lectures

52.4% of the “Double First-Class” libraries held online lectures during the pandemic (see Table 3, sorted by the launch time). Two main teaching methods were used: live broadcast and recorded broadcast. Live broadcast (95.5%) was far more than recorded broadcast (18.2%). 13.6% of libraries actually used live broadcast plus recording, 27.2% of them used live broadcast with replay option. Online lectures were carried out on various online platforms, such as Tencent Meeting, ZOOM, Bilibili, DingTalk, Rain Classroom, Blackboard, and others. The most popular online platforms were Tencent Meeting (36.4%), Zoom (22.7%), Bilibili (22.7%, including official accounts and personal accounts). The Bilibili’s re-play function allows students to choose their own study time. 50% of online lectures provided by the libraries were free and open to the public, 27.3% were not, and 22.7% were partially open to the public.

Apart from online lectures delivered by the libraries alone, 76.2% of those libraries cooperated with database vendors to offer their courses or shared online training. The data showed that 35.7% of 42 academic libraries not only created their own content for online lectures, but also collaborated with database vendors to put forward more content for students. 40.5% of the libraries only worked with database vendors and business partners for share online training without any of their own content.

Even if 52.4% of the “Double First-Class” academic libraries had launched online lectures during the pandemic, sometimes the information literacy education could hardly reach the expected goals. The cases and data in the study showed that the cooperation among libraries, and between the library and departments had expanded the impact of information literacy education. For example, the Tsinghua University Library and the Graduate School jointly launched a series of live lecture broadcasts on “Scientific Talents Development”. The number of students attending the 17 live broadcast lectures reached 6940. Cooperated with Daxia Academy, Meng Xiancheng Academy, and Economic Management Academy, the East China Normal University Library presented live broadcast lectures on “Science and Innovation Series”. One of the lectures attracted many students from this and some other universities. The total number of attendees reached 3200. More students actually received the information literacy education as a result of the cooperation.

### Online information literacy courses

After colleges and universities in China started their spring semester on the cloud in 2020, these 42 academic libraries also set up online information literacy courses, including compulsory courses, general courses, and elective courses. Course information was generally released in the university’s course selection system which was only available to its own faculty members and students. Among them, four academic libraries released course selection information on the social media platform WeChat as well. The Southern China University of Technology Library released a chapter of the course video on the Bilibili, but the library website did not show the latest course information during the pandemic.

Nankai University Library summarized every aspect of its online information literacy course, from the course preparation, teaching platform, teaching librarian and support team, to course assessment, etc. to attract students to this course. Tsinghua University Library’s “Document Retrieval and Utilization (Social Sciences Session)” online course used the Tencent Meeting for live broadcast, which was open to everyone and attracting many peers. With the help of third-party platforms, some librarians from the East China Normal University Library, Tsinghua University Library, and Wuhan University Library taught information literacy courses online, such as “Literature Research and Information Literacy” on the online New Oriental Learning Library, “Information Literacy” and “Information Literacy and Practice” lectures on the MOOC platform. All of them attracted many people and were welcomed by the attenders. The courses provided students and other users with much needed knowledge on information literacy (ECNU Library, 2020; Tsinghua University Library, 2020; WHU Library, 2020a).

### The characteristics of online teaching during the pandemic

Information literacy education was mainly conducted online during
the pandemic. The data collected and analyzed in this study demonstrate that the online teaching carried out at the 42 academic libraries in China during the pandemic has the following characteristics: rapid response to the pandemic, recommending reliable information resources to students and other users, developing cases for searching information on COVID-19, and fighting against misinformation and disinformation.

Rapid response to the pandemic

On January 23, 2020 when the city Wuhan was locked down due to the pandemic, both the Wuhan University Library and the Huazhong University of Science and Technology Library in Wuhan responded quickly. They adjusted and released their services information on WeChat on the same day although it was the time during the winter break and the Chinese New Year week-long vacation. All 42 “Double First-Class” academic libraries laid out their new service plans to deal with the pandemic before January 31, 2020. The libraries all temporarily closed their physical locations for the sake of staff safety, but the information resources had been always provided through online services. Among 42 libraries, 11.9% of them incorporated information literacy education into the overall online services. For example, the Peking University Library issued a notice on January 31, 2020 that online services already included information literacy education. Although the rest of libraries did not include information literacy education in their emergency measures in the early stage of the pandemic, some librarians started preparing and initiated information literacy mini-courses even before beginning dates of the spring semester were set. One-third of video mini-course series and all the series of text-picture mini-courses were launched before the end of February 2020. The information literacy MOOC taught in “Double First-Class” libraries also started from February 1st to 17th, 2020, which was earlier than the beginning of the spring semester at those colleges and universities. It reflected the ability of information literacy education to respond quickly. After February 17, 2020, Tsinghua University, Peking University, and other universities successively started their spring semester “on the cloud”. Their libraries all responded actively and launched online information literacy courses one after another, of which 45.45% started the series of online information literacy lectures before the end of March, and 33.3% of the lectures were taught 10 times each.

| Academic Library | Lecture Topic | Lessons | Lecture Time | Online Platform | Live or Video |
|------------------|---------------|---------|--------------|----------------|--------------|
| XMU              | iCollege      | 12      | Feb. to Jul. 2020 | Tencent Classroom + Bilibili | Live + video |
|                  | ECNU          | 14      | Mar. to Jun. 2020 | Blackboard | Video |
|                  | Research Innovation | 3      | Mar. to May 2020 | Tencent Meeting | Live + video |
|                  | How to Spot Fake News during the Pandemic | 1 | May 2020 | Bilibili | Live + video |
| SCU              | Online Training | 15 | Mar. to Jun. 2020 | Tencent Meeting | Live |
|                  | Promotion of Research Skill | 17 | Mar. to Jun. 2020 | Tencent Meeting + Rain Classroom + Bilibili | Live + video |
| BNU              | Information Literacy Online Training | 23 | Mar. to Jun. 2020 | Unknown | Live |
| SCU              | One-Hour Training | 37 | Mar. to Jun. 2020 | Bilibili | Live |
| WHU              | 90 Minutes Training | 9 | Mar. to Jun. 2020 | Tencent Classroom | Live |
| SJTU             | One-Hour Training | 14 | Mar. to Jun. 2020 | Blackboard + DingTalk | Live + video |
| SZJTU            | SJTU Information Literacy | 10 | Mar. to Apr. 2020 | Zoom | Live |
| DLUT             | Library Live Class | 8 | Apr. to Jun. 2020 | Tencent Meeting + Cloud Drive | Live + video |
| NWPU             | NWPU Information Literacy | 10 | Apr. to Jun. 2020 | Tencent Classroom + WeChat Platform | Live + video |
| SCUT             | Online Training | 6 | Apr. to Jul. 2020 | WeChat Platform | Video |
| SEU              | Information Literacy Online Training | 11 | Apr. to Jun. 2020 | Tencent Classroom | Live + video |
| PKU              | Promotion of Software Skills | 4 | May 2020 | Tencent Meeting | Live |
| JLU              | Online Training | 16 | Apr. to May 2020 | Chaoxing Mobile Library + Bilibili | Live + video |
| NWAU             | Training Every Week | 5 | Apr. to Jun. 2020 | QQ Group Classroom | Live |
| SYSU             | Patent Online Training | 4 | Apr. to 2020 | Tencent Meeting + Zoom | Live |
| TONGJI           | Research Innovation | 2 | Mar. to Apr. 2020 | Zoom | Live |
| RUC              | Library Resources and Service | 13 | May to Jun. 2020 | Tencent Meeting + Rain Classroom | Live |
| XJTU             | Library Online Training | 16 | May to Jun. 2020 | Tencent Meeting | Live |
| CQU              | Intellectual Property One-Hour Training | 4 | May to Jun. 2020 | Unknown | Live |
| HIT              | Library Information Online Training | 5 | May to Jun. 2020 | Tencent Meeting | Live |

Note: BNU-Beijing Normal University; CQU-Chongqing University; DLUT-Dalian University of Technology; ECNU-East China Normal University; FUDAN-Fudan University; HUST-Harbin Institute of Technology; HUST-Huazhong University of Science and Technology; JLU-Jilin University; Lzu-Lanzhou University; MUC-Minzu University of China; NANKAI-Nankai University; NU-Neortheastern University; NJU-Nanjing University; NUDT-National University of Defense Technology; NWAFU-Northwest A&F University; nwpu-Northern Polytechnical University; OUC-Ocean University of China; PKU-Peking University; RUC-Renmin University of China; SCU-Sichuan University; SCUT- South China University of Technology; SXJ-Scut-South China University of Technology; SEU-Southeast University; SJTU-Shanghai Jiao Tong University; SYSU-Sun Yat-sen University; TGU-Tianjin University; TONGJI-Tongji University; TSINGHUA-Tsinghua University; WHU-Wuhan University; XJTU-Xian Jiaotong University; XMU-Xiamen University; ZJU-Zhejiang University.

Introducing and promoting authoritative and reliable high-quality information resources is one of the most important parts for the information literacy. Promotion of resources during the pandemic mainly includes the following three aspects:

The first aspect is recommending good database resources. From late January to the late of July 2020, the number of database visits surged sharply. To meet students’ needs, the academic libraries published the guide to database resources, utilized VPN, CARSI, WAYFless, etc. to provide off-campus access and to ensure the no-barrier use of databases. The Southeast University Library, the Library of University of Electronic Science and Technology of China, and some other libraries released the English version of the electronic resources guide for international student population during the pandemic. The second is introducing free academic resources. Many publishers, database vendors released free resources in this period. 95.2% of academic libraries introduced these free resources to their users. The Tsinghua University Library launched a series of resource recommendations for “free resources during the pandemic” after those resources were tested, confirmed, and integrated. The third aspect is providing research resources on COVID-19. The data showed that 59.5% of academic libraries studied in this research acted quickly to collect, sort out, and post new research resources and information on COVID-19 and its prevention, treatment, etc. For instance, Wuhan University Library posted a column entitled Research Resources on COVID-19. The column was divided into eight sections: academic...
clustering and analysis websites, COVID-19 visualization, experimental information, major medical journals, prevention information, and keyword recommendations, WeChat public accounts, and sharing Chinese experience (WHU Library, 2020b). Xi’an Jiao Tong University Library published an online column Special Literature on COVID-19 which included six parts: new publications, journal articles, topic readings, COVID-19 Literature Hub, literature analysis, and catalog browsing (XJTU Library, 2020).

Developing pandemic search cases

Information literacy education was taught in conjunction with the cases of information search on COVID-19. Wuhan University Library, Shanghai Jiao Tong University Library, and Tsinghua University Library used “coronavirus” related literature retrieval as examples to teach information literacy. They did it from different perspectives. In February 2020, a librarian at the Wuhan University Library taught a mini-course “To Be an Academic Search Expert” on a media platform. This course explained the search strategy for information related to COVID-19 research in five steps: looking for related research and analysis, deciding search terms and methods, choosing search tools, analyzing and optimizing search results, and managing retrieval results and tracking the most current research. The retrieval process is simple and easy to use, with one step closely linked to the next. Not only did it show clear retrieval route, but also emphasized that the discovery system could help students and researchers find relevant research documents at one stop. Additionally, it could also provide more references and selections of comprehensive databases required for further research. At about the same time, librarians at the Shanghai Jiao Tong University Library launched a mini-course called “Pandemic Research E-Net” on a media platform. It introduced retrieval techniques about searching information related to the COVID-19 in five steps, which included finding Chinese search terms, finding English search terms, selecting appropriate search terms, subscribing to search results, and browsing the column of research resources on COVID-19. A librarian at the Tsinghua University Library did an online live broadcast at the Tencent Meeting on February 17, 2020. It was the first lecture of information literacy education on three popular platforms, namely libraries’ official websites, social media WeChat, and Bilibili. Libraries’ official websites are the main platform for libraries to publish the information. Information literacy columns on libraries’ websites can release information after it has been categorized or integrated, which is helpful for students to view information in a more systematic manner. The data collected indicated that 42 “Double First-Class” academic libraries all have information literacy-related columns posted on their websites, but only 21.4% of them had updated their information in the spring semester 2020. The public account on the WeChat platform has become the additional common venue for libraries to release their information to the public. On the WeChat platform, not only information literacy information can be released, but also videos on different types of information literacy mini-courses and special topics can be easily uploaded. It allows students to both obtain information instantly and learn information literacy systematically. 95.2% of the “Double First-Class” academic libraries released information on information literacy courses through the WeChat platform during the pandemic. The newer platform Bilibili has turned into the primary learning social media for young people. Besides uploading videos, this platform can be used for live broadcast, and interacting with students through bullet screens and comments. In addition, videos uploaded can also be used for secondary development. For example, the East China Normal University Library split a long video of a lecture into several short videos with subtitles and text which is more suitable for students who do not have a chunk of time to learn when they have only a few minutes. To reach out to more students, four

Conclusions and suggestions

Libraries like other professions faced many challenges and difficulties in the year 2020 because of the global health crisis caused by the coronavirus. After the world marched into the year 2021, cases of COVID-19 are still increasing. Although the vaccines have been distributed to some frontline medical staff and some groups of people in some countries, the whole world is still in the pandemic which hits really hard on the global economy and heavily affects peoples’ daily life. Reviewing and analyzing information literacy education carried out by the “Double First-Class” academic libraries in China in the spring semester 2020 will help libraries further understand the significance of information literacy education in the worldwide crisis. Sharing experiences gained through practice with other libraries will help more libraries be prepared in response to emergencies in the future. Based on the analysis and discussion above, some suggestions and recommendations are made below for further development and improvement of information literacy education under the new norm of pandemic prevention and control.

Using multi-platform such as social media to boost online courses

The study showed that “Double First-Class” academic libraries have made many attempts and efforts to promote information literacy education in pandemic, but a number of them did not arouse enough awareness among, or exert enough influence on, faculty and students. These 42 libraries mainly released information about information literacy education on three popular platforms, namely libraries’ websites, social media WeChat, and Bilibili. Libraries’ official websites are the main platform for libraries to publish the information. Information literacy columns on libraries’ websites can release information after it has been categorized or integrated, which is helpful for students to view information in a more systematic manner. The data collected indicated that 42 “Double First-Class” academic libraries all have information literacy-related columns posted on their websites, but only 21.4% of them had updated their information in the spring semester 2020. The public account on the WeChat platform has become the additional common venue for libraries to release their information to the public. On the WeChat platform, not only information literacy information can be released, but also videos on different types of information literacy mini-courses and special topics can be easily uploaded. It allows students to both obtain information instantly and learn information literacy systematically. 95.2% of the “Double First-Class” academic libraries released information on information literacy courses through the WeChat platform during the pandemic. The newer platform Bilibili has turned into the primary learning social media for young people. Besides uploading videos, this platform can be used for live broadcast, and interacting with students through bullet screens and comments. In addition, videos uploaded can also be used for secondary development. For example, the East China Normal University Library split a long video of a lecture into several short videos with subtitles and text which is more suitable for students who do not have a chunk of time to learn when they have only a few minutes. To reach out to more students, four
“Double First-Class” academic libraries posted mini-courses or lecture videos of information literacy on Bilibili through their official accounts. Two libraries posted videos of information literacy by using librarians’ personal accounts on the Bilibili. Although more than half of the “Double First-Class” academic libraries offered online courses and posted the videos of information literacy on multiple platforms in the spring semester 2020, 47.6% of the libraries did not offer any much needed information in the same period. Under the new norm, libraries need to take advantage of all available platforms, including mobile apps, to provide information literacy materials for students and other users. Using new technologies to enhance the ability to offer information on information literacy and to boost online courses will not only support the continuation of information literacy education during the global crisis, but also give students the flexibility of learning wherever they are and whenever they can.

Innovating teaching model through online and offline integration

In the first half of 2020, online information literacy education in China mainly included online live-broadcasting lectures and courses, videos of mini-courses, text-picture mini-courses, and MOOCs. Analyzing the advantages of these different teaching methods can help librarians choose a suitable online teaching method according to their needs and better integrate online teaching with offline teaching. For example, a mini-course video is more intuitive than a text-picture mini-course, but the production cycle of a video is longer, its update is slow, and the content in the video cannot be retrieved. Text-picture mini-courses have fast timeliness, flexible production, and can be conveniently updated. They are easy to read and can be used to find a certain knowledge point directly. As to live broadcasting, it offers a classroom atmosphere and can support interaction in real time, but it may also be affected by factors such as internet speed and conditions. Recorded broadcast can be watched repeatedly, but lacks real-time interaction. Librarians need to go through another social media, such as using QQ Groups or WeChat groups, to interact with students.

The importance of online teaching has been highlighted under the current circumstance, but the rapid transition of information literacy education from the classroom to online teaching was a passive adaptation forced by the serious situation in the spring 2020. Although more than half of the “Double First-Class” academic libraries had online information literacy courses in the spring semester 2020, 47.6% of the libraries did not get courses ready in that period. Even at those libraries that had online courses, the data showed that only 22.2% of the video mini-course series and 15.8% of the text-picture mini-course series continued from January to July in 2020. 54.8% of the mini-courses lacked systematicity. After carrying out online teaching in Spring 2020, information literacy education returned to offline teaching in the fall in China. Since COVID-19 continues to spread worldwide, online teaching is still a main method used by many academic libraries around the world when traditional classroom teaching is limited or unavailable. Facing the current serious situation, libraries should change their approach from passive adaptation of online teaching to active exploration so that they can teach online courses more effectively and innovatively. The president of Tsinghua University, Qiu Yong, proposed “promoting comprehensive offline and online integrated teaching” under the uncertainty of pandemic the world is still facing (Tsinghua University, 2020). Libraries make full use of their hardware and software, and redesign teaching model to enable students both on site and at distance to fully participate in learning. Information literacy education needs to prepare different teaching plans to respond to different requirements, such as using online tools only when pandemic gets worse, and getting back to classroom when the pandemic situation is stable. Sometimes librarians may need to combine both methods to teach information literacy courses when some students can take courses in person and some are not able to. Online platforms, such as Tencent Meeting, ZOOM, Rain Classroom, and others are excellent tools to be applied into information literacy education under the new norm of people’s life. Libraries’ ability to be flexible and prepared for different teaching requirements needs to be further improved. Another benefit libraries can get is that offline classrooms can use online teaching tools to promote online preview, testing, in-class instruction and interaction, using online resources and carrying on discussions after class. For example, the East China Normal University Library launched live lectures on science innovation, which were recorded and stored on online teaching tools “Rain Classroom” for students so that they could watch, ask questions and post feedback when they had time.

Based on the real situation and needs to expand opportunities and contents in teaching

Framework for Information Literacy for Higher Education” published by the ACRL emphasizes that information literacy education should be integrated into “context”. The pandemic the world is facing is the true context for information literacy education. Wang Tao pointed out that higher education can use the current pandemic as a teachable moment (ACRL, 2016; T. Wang, 2020). Some librarians at the “Double First-Class” libraries, such as the Wuhan University Library, the Tsinghua University Library, and the East China Normal University Library, updated their teaching syllabi and contents according to their current situations to make information literacy curricula more suitable to the students’ needs. However, the online mini-courses and lectures reviewed in the research revealed that a number of courses on information literacy taught at these academic libraries used previous syllabi and course materials and did not update them in the spring semester 2020.

Information literacy education should consider how to learn from real events and experiences in such a sudden and major public health event that all members of society experience together. Librarians can design some teaching themes based on real situation and research topics on COVID-19 to guide students to learn information literacy. For example, many users want to get some information on how to protect themselves from getting the coronavirus. Librarians can take this topic as a current focus of information literacy education and help users gain experience on searching information and materials that are much needed efficiently and effectively. Such a new teaching approach and experience of combining real cases with information literacy education not only allows librarians to better respond to users’ urgent needs, but also increases users’ interests in information literacy. After the world gradually returns to normal life, how to continue to incorporate new teaching methods and ideas gained in this global health emergency into information literacy education under the new norm and prepare for possible emergencies in the future is a topic worth considering.

Other than the urgent information needs, students at different grades and levels have their own special needs. For instance, students in the graduation season usually are busy with their final sprint for graduation thesis, and sophomores are eager to try and prepare for participating in scientific innovation activities, etc. Apparently, these information needs must be taken care of as well. Some “Double First-Class” academic libraries held various thematic lectures, including topics for graduation thesis, science and innovation, research subject, and tools and their application. The Xiamen University Library provided online live courses to assist students with their thesis writing. All courses were recorded and could also be viewed on the Bilibili. To find out and meet students’ special needs, it is important for libraries to take survey and interviews regularly to collect data and feedback. Through analysis of students’ different needs, librarians can better design teaching methods and customize teaching content to offer students what they really want.

Fighting fake news and misinformation

Nowadays people encounter massive information through all kinds of media. After the outbreak of COVID-19, another big wave of
information about the coronavirus, its prevention and treatment, etc. had appeared. People were eager to search and browse the information via different types of media. Due to the complexity and some unknown aspects of the coronavirus, some information published on non-authorized publication contained some false information, disinformation and misinformation. With the rapid spread of various information about the coronavirus and pandemic through the Internet, identifying false information has become a new demand for information literacy education. However, the study showed only 14.3% of “Double First-Class” libraries had taught mini-courses or given live lectures on how to identify false information. The number and scope of influence were not enough to stop the spread of misinformation. 92.0% of the libraries that provided research resources on the coronavirus had problems, such as untimely updates, incomplete resources, and insufficient classification. Leetaru’s (2019) article published on Forbes states that even digital natives who grew up in an information-saturated online world will not be able to do a better job on discerning the credibility of information. The Republic of Korea and the UNESCO jointly organized “Global Media and Information Literacy Week” in October 2020, with the theme of “Resisting Disinfodemic: Media & Information Literacy for Everyone & by Everyone” (UNESCO, 2020b). The statement on its web page emphasizes the important role of media and information literacy in improving people’s competencies to against disinformation. The IFLA issued the “IFLA Statement on Fake News” in 2018. It called for libraries’ attention to their institutional and ethical obligation to help users obtain reliable and authentic information (IFLA, 2018). Librarians as information professionals have the responsibility, reputation and skills to make significant contributions. The IFLA also updated its popular version of “How to Spot Fake News: COVID-19 Edition” in April 2020 (IFLA, 2020b). The infographic shows 8 ways people can take to fight misinformation around coronavirus. Information literacy education should take IFLA documents as guidelines, expand content of information literacy to increase the awareness of information identification, and use case study to integrate the IFLA philosophy and the 8 ways into both in-person teaching and online courses. The librarians at the East China Normal University Library added a special session to their online information courses to discuss approaches on how to identify false information and misinformation about COVID-19. The discussion helped students learn scientific methods to search information and determine its true or false attributes, e.g. paying attention to where information originated, the wording used in the information, etc.

Strengthen multi-party cooperation

It is crucial for students to be equipped with information literacy and skills when the whole world faces huge health crisis and large amounts of information from different types of media. Academic libraries can take advantage of the Internet to promote information literacy through extensive multi-party cooperation. First, libraries need to establish cooperation with student organizations and groups to better understand what students really want and need so that information literacy education can be more fit with students’ needs. Meanwhile, libraries can also find out and utilize the expertise of some students to organize joint lectures or series on some special topics on which librarians may not have enough knowledge. For example, Wuhan University Library invited software experts from the Bilibili and the student GenJi as the library resident lecturers for 90-minute training series with the theme on video production. The series were welcomed by students. Second, libraries need to seek cooperation with faculty and administrations at other colleges and departments within their universities. Working with faculty members, librarians will be able to develop more embedded courses based on specialized or discipline-related subjects. Additionally, libraries can also cooperate with colleges, graduate schools, career guidance centers, etc. For example, the East China Normal University Library collaborated with the DaXia College, the Meng XianCheng College, and the College of Economics and Management to deliver lectures on science innovation and information literacy which were well received by students. Third, cooperation among libraries and librarians provides important opportunities for libraries and librarians to share with each other their expertise and specialties. In the middle of the pandemic, an online lecture series was offered jointly by senior librarians from several libraries. It was called “Information Literacy Lectures for the Public”. Each lecture, live broadcasted, attracted many people attending, ranging from 2000 to 8000 individuals. Not only did students benefit from this type of collaboration, librarians could also learn from each other. Fourth, libraries need to work with database vendors. The database vendors usually have good specialized trainers. They can support libraries’ information literacy education with online live-broadcasting training sessions or recorded videos. Librarians can choose different options according to their actual situations and needs. Fifth, libraries in different countries may have different strategies and approaches when they deal with the difficulties they are facing now. Libraries need to collaborate at the international level to share and exchange their ideas, strategies and approaches so as to better serve their users. The Internet brings convenience to the cooperation. Additionally, the coronavirus is still spreading on every continent and caused a global health crisis. Scientists, researchers, doctors and even ordinary people are eager to find the information and data on COVID-19 in order to understand it as much as possible for better prevention and treatment. Libraries are in a vital position to provide reliable information and data to support scientific research and people’s information needs. Cooperation among libraries around the world will provide our society more access to information and data. In April 2020, the Tsinghua University Library and the Wuhan University Library co-sponsored the “2020 Academic Libraries Advanced Seminar on Knowledge Service and Innovative Application.” The seminar invited both domestic and foreign experts, such as the vice dean of the Cornell University Library, to give keynote speeches. This seminar was held successfully due to the cooperation among libraries and database vendors, including international collaboration. Information literacy education can learn from this model. The author of “A Brief History of Humankind” Yuval Harari said during the pandemic: “Yes, the crisis will eventually pass, and most of us will survive—but the world we live in will no longer be the same” (Harari, 2020, p. 32). The pandemic has changed our daily life, as well as our education and learning model. Libraries are not just dealing with the present situation, but also need to focus on the future. The experience gained and the lessons learned in the spring semester 2020 provide an opportunity for libraries to think more about how to improve information literacy education so that it can be more flexible to meet users’ information needs in the future. That is the purpose of this research.

CRediT authorship contribution statement

Jinchi Guo: Conceptualization, Formal analysis, Investigation, Data curation, Writing - Original draft, Funding acquisition.
Jie Huang: Conceptualization, Investigation, Methodology, Validation, Writing - Original draft.

Acknowledgement

This paper is one of the research projects, “Practical Research on Mobile Information Literacy Education in University Libraries” (Project No.: 16BTQ006), funded by the National Social Science Fund of China.

References

ACRL. (2016). Framework for information literacy for higher education. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/framework1.pdf. (Accessed 23 July 2020).
ACRL. (2020). Pandemic resources for academic libraries. https://acrl.libguides.com/pandemic/. (Accessed 23 July 2020).
ALA. (2020). Pandemic preparedness. http://www.ala.org/tools/atoz/pandemic-prepare/dsens. (Accessed 23 July 2020).
Beijing Normal University Library. (2020). 遭遇哲学智慧的挑战：新冠假消息（identify COVID-19 fake news). https://mp.weixin.qq.com/s/xK6h85CRzhlPln1FduaspEmqg (Accessed 23 July 2020).

Cai, Y., & Wu, Z. (2020). COVID-19 and information literacy: a selective list of useful resources. https://www.cilip.org.uk/news/cilip-coronavirus-information-service.htm. (Accessed 23 July 2020).

Chen, C. (2020). 如何应对“信息疫情”:再谈疫情防控阻击战中的信息情报（How to deal with infodemic: On information and intelligence in the prevention and control of pandemic). 科技通报 (Competitive Intelligence), 16(2), 1. https://doi.org/10.19442/j.cnki.cn10-1205/2020.02.002

Chinese Ministry of Education. (2020). COVID-19 and information literacy: a selective list of useful resources. https://www.cilip.org.uk/news/cilip-coronavirus-information-service.htm. (Accessed 23 July 2020).

Chinese Ministry of Education. (2015). http://www.moe.gov.cn/jyb_xwgx/moe_1777/201511/20151105_217823.html. (Accessed 10 March 2020).

Chinese Ministry of Education. (2017). 双一流“建设高校及建设学科名单 List of “double first-class” universities. http://www.moe.gov.cn/z78/A22/A22ztzl/zxtj_pt/sylt_jgxs/2017121017217823.html. (Accessed 23 July 2020).

Chinese Ministry of Education. (2020a). http://www.moe.gov.cn/jyb_xwgh/gbwt_gdzt/z5987/20200303/430163.html. (Accessed 23 July 2020).

Chinese Ministry of Education. (2020b). http://www.moe.gov.cn/jyb_xwgh/gbwt_gdzt/z5987/20200303/430163.html. (Accessed 23 July 2020).

Cook, P. G. (2020). Digital info literacy of educational material: A commentary. (How to identify pandemic information). http://library.koolearn.com/. (Accessed 23 July 2020).

CILIP. (2020). CILIP Coronavirus Information Service. https://www.cilip.org.uk/news/cilip-coronavirus-information-service.htm. (Accessed 23 July 2020).

East China Normal University Library. (2020b). 2020年教育信息化和网络安全工作要点 (Key points of education informatization and cybersecurity in 2020). http://xhk.resorce.edu.cn/news/1578.html?from=groupmessage. (Accessed 23 July 2020).

Gu, J. (2020). 抗疫形势下的信息素养 (Information literacy during the pandemic). https://mp.weixin.qq.com/s/xK6h85CRzhlPln1FduaspEmqg (Accessed 23 July 2020).

Guo, J. (2020). 信息素养与实践 (Information literacy and practice). https://mp.weixin.qq.com/s/xK6h85CRzhlPln1FduaspEmqg (Accessed 23 July 2020).

Guo, J. (2020). 疫情信息满天飞 如何辨别真假 (How to identify pandemic information). https://mp.weixin.qq.com/s/s0fH0fHqpp9QHNPJZBPEQ (Accessed 23 July 2020).

Harari, Y. N. (2020). 突发公共卫生事件中的科学应对与思考 (Scientific response and reflection of public health emergencies: A compulsory course in academic research). https://next.xuetangx.com/course/THU1205100419/1513624. (Accessed 23 July 2020).

Huawei University Library. (2020a). http://www.moe.gov.cn/jyb_xxgk/moe_1777/201511/20151105_217823.html. (Accessed 10 March 2020).

Huawei University Library. (2020b). http://www.moe.gov.cn/jyb_xxgk/moe_1777/201511/20151105_217823.html. (Accessed 10 March 2020).

Jie Huang is Special Projects Cataloging Librarian at the Pennsylvania State University Libraries, Pennsylvania, U.S.A. Prior to this position, she was associate professor/cataloger at the University of Oklahoma Libraries. Her research interests include library services and technology, information retrieval, and information organization. She has published a number of articles in peer reviewed journals, such as Cataloging and Classification Quarterly, Libri, Reference & User Services Quarterly, Library Management, and Library Trends.

Ke, P. (2020). 疫情防控期间信息素养的建设 (Research resources on information literacy and practice). https://mp.weixin.qq.com/s/s02gztC2zG-Coll7Thk4wEQ (Accessed 23 July 2020).

Shi, Y. (2020). 疫情期间培养学生甄别信息的能力 (Cultivate students' information discrimination ability during the pandemic). https://mp.weixin.qq.com/s/z220hcyf0Dl4Sbato/b/e0zGg. (Accessed 23 July 2020).

Su, X., et al. (2014). 科学研究与竞争情报研究 (Research on the concept and instructional application of micro-lesson). 中国电化教育 (China Educational Technology), 7, 94–99.

Taihu University. (2020). http://www.whu.edu.cn/cp/html/2020/20200317/17918.html. (Accessed 23 July 2020).

Wang, F., An, L., Huang, R., & Wang, X. (2020). 突发公共卫生事件中的科学应对与思考:疫情下图情专家谈新冠疫情 (Research on the concept of 'infodemic'). 图情专家谈新冠疫情 (Research on the concept of 'infodemic'). (China Educational Information and Communication Information Response). (Accessed 23 July 2020).

Wang, S. (2020a). 时代呼唤信息素养 (Information literacy and practice). http://library.koolearn.com/. (Accessed 23 July 2020).

Wang, S. (2020b). 时代呼唤信息素养 (Information literacy and practice). http://library.koolearn.com/. (Accessed 23 July 2020).

Wang, T. (2020b). 疫情中的数学契机 (Teachable moment in the pandemic). http://mp.weixin.qq.com/s/p2ztG2ZSC-GalZ7TiwekEQ (Accessed 23 July 2020).

Wang, Y. (2020c). 再谈疫情防控阻击战中的信息情报 (Research on the concept of 'infodemic'). https://doi.org/10.1360/SSV-2020-11071. (Accessed 23 July 2020).

Wuhan University Library. (2020a). http://www.whu.edu.cn/services/news/2020/03/06/PDF_COVID-19Misinfodemics-1.pdf. (Accessed 23 July 2020).

Wuhan University Library. (2020b). http://www.whu.edu.cn/services/news/2020/03/06/PDF_COVID-19Misinfodemics-1.pdf. (Accessed 23 July 2020).

Xie, B., He, D., Mercer, T., et al. (2020). Global health crises are also information crises: A专题文献 (Ten characteristics of “infodemic”). https://www.cilip.org.uk/news/cilip-coronavirus-information-service.htm. (Accessed 23 July 2020).

Xi’an Jiaotong University Library. (2020). COVID-19专题文献 (Special literature on COVID-19). http://www.lib.xjtu.edu.cn/articles/Covid-19/home.html. (Accessed 23 July 2020).

Zurkowski, P. G. (1974). The information service environment relationships and priorities. Related paper no. 5. https://eric.ed.gov/?id=ED100391. (Accessed 23 July 2020).