LIBRARY SERVICES FOR SCIENCE AND EDUCATION SUPPORT

SHEMAIEVA H. V.
Department of Documentation and Ukrainian language, National Aerospace University
M. E. Zhukovsky (Kharkiv, Ukraine), e-mail: annashemaeva@ukr.net,
ORCID 0000-0002-1053-989X

KOSTYRKO T. M.
Scientific Library, Admiral Makarov National University of Shipbuilding (Mykolaiv, Ukraine),
e-mail: tamara.kostyrko@nuos.edu.ua, ORCID 0000-0002-4175-9975

Formation and Use of Open Access Resources in University Libraries during the Pandemic and Martial Law in Ukraine

Objective. The research is aimed at revealing the repository as an important tool for storing and promoting open access resources and open educational resources (OER) as a component of open access resources, and the role of the library in these processes. **Methods**. To achieve the purpose of the research, a complex of scientific methods was applied, including analysis and synthesis, comparison, statistical method and direct study of practical experience through the analysis of library reports. **Results.** During the research it was summarized the information about open access resources, in particular OER; examples of the national policy of forming repositories were considered; the experience of the formation and use of institutional repositories in the technical universities of Kharkiv and Mykolaiv was studied; the foreign experience of creating and functioning of repositories of the information-library profile was considered. **Conclusions.** The further direction of the university library in the promotion of the OER initiative is substantiated, namely, convergence of library activities with educational activities in the aspect of creating, planning, and organizing access to open educational electronic resources.

Keywords: open access resources; open educational resources (OER); university library; national repository; institutional repository; LIS repository; COVID-19; martial law in Ukraine

Introduction

Modern unexpected challenges related to the pandemic and martial law in Ukraine have intensified the development of distance learning. In turn, distance educational practice has led to the development and distribution of high-quality open access resources, in particular, open educational resources (OER) based on modern technologies.

In the organization of access to open access digital resources, in particular OER, and their dissemination, the importance of the university library is growing. Creation of quality content for online education and science is becoming one of the most important tasks of library activity. University libraries promptly adapted the library environment for the distance educational process, they support open access resources, ensure their use in distance education.

One of the important places in the system of open access resources is given to national, institutional, and disciplinary repositories, which combine a complex of various scientific and educational resources. In the current crisis period, the problems of improving the quality of the information and educational environment based on the use of open access resources and OER, as well as repositories and the place of the library as a kind of platform for storing, checking, adapting, and using digital educational resources are discussed (Katz, 2020; Mičunović, Rako, & Feldvari, 2021; Kolesnykova, 2021a; Kolesnykova, 2021b).

In connection with the above, the use of repositories as a kind of archive of open access resources and open educational resources and as an important tool in distance education is a relevant and urgent task today.

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Ukrainian and foreign scientists raise a wide range of issues of open educational resources, libraries as places of their storage, and access platforms (Katz, 2020; Kolesnykova & Matveieva, 2021; Lingdan, 2021; Markin, 2021; Mičunović, Rako, & Feldvari, 2021; Moreiraa et al., 2017; Tammaro, 2020; Zhou, 2021).

The **purpose** of the publication is to highlight the development of repositories in the context of open access resources and, in particular, open educational resources: national, institutional, informational, and library profile (as an example of thematic ones) and the role of the library in their creation and distribution.

Methods

During the organization and conduct of the research, the methods of analysis and synthesis, comparison, study of practical experience of library activities in relation to digital open educational resources and open access resources, in particular repositories, statistical methods were used. At the same time, we discussed the topic of OER development in the world and the experience in this direction of the Scientific Library of the Ukrainian State University of Science and Technologies (Dnipro).

Results and Discussion

The philosophy and practices of openness in the context of the repositories' development since the beginning of this millennium have a huge reflection in world literature. For example, 1,710,000 references (for all time) were found in Google Scholar for the keyword "institutional repository," including 42,300 references in the chronological framework of 2021-2022. For the keyword "institutional repositories in Ukraine" 21,700 (for all time) were found, including 7,340 in the chronological framework of 2021-2022. In the library context, this is also a popular topic, 5,250 during 2021-2022.

At the same time, for the library community of Ukraine, the topic of open educational resources (OER) is almost "terra incognita." For example, today we have found real practices of creating Open textbooks (OT) in partnership with teacher-authors and integrating OT into global OER systems only in the Scientific Library of the Ukrainian State University of Science and Technologies, Dnipro, Ukraine (Kolesnykova, 2019; Kolesnykova, 2021a; Kolesnykova, 2021b; Scientific Library, n.d.).

We also found three of the planned ten open video lectures (as non-textual OERs) created by Tetiana Kolesnykova and Tetiana Shcherbatiuk, researchers from the Scientific Library of the Ukrainian State University of Science and Technologies (Kolesnykova & Shcherbatiuk, 2022) in the framework of improving the awareness of the academic communities in Ukraine (teachers, librarians, students, etc.).

So, let us focus on the topic of OER. For the first time, the issue of open educational resources was raised in 2002 at the UNESCO forum. In recent years, several documents related to OER have been prepared. In the recommendations of UNESCO and scientific publications, such resources include various types of digital text, multimedia, software, and other educational materials that are part of the public domain or are distributed under an open license with the possibility of their adaptation to the educational process. These are educational, methodical, scientific materials, as well as freely available software tools, used to support learning and can be changed or modified by the user in order to solve scientific and educational tasks (Markin, 2021; Mičunović, Rako, & Feldvari, 2021).

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The international OER movement is aimed at systemic changes in the educational process based on the involvement of teachers and students in joint creativity.

OER policy allows teachers to:
− distribute their own scientific and educational developments;
− study new teaching experience;
− include open educational resources in their own disciplines, curricula;
− develop professional communications;
− implement joint projects;
− improve their own and develop new educational and methodological materials based on existing open resources, taking into account copyright.

For students, OER facilitate:
− obtaining additional information and deepening knowledge of relevant disciplines;
− preparation for seminar and independent tasks;
− performance of qualification works;
− participation in the development of educational materials;
− development of cooperation with teachers and other students.

In the context of OER, the importance of such a resource as a repository is increasing. The formation of *national repositories* focused on the development and implementation of OER is being developed (Markin, 2021; Mičunović, Rako, & Feldvari, 2021; Lingdan, 2021; Moreiraa et al., 2017).

National solutions differ in both resources and approaches to their creation and use:
− in France, the main emphasis is on research results;
− in Japan, a repository is being formed as an aggregator combining about 90 institutional repositories;
− in Spain, the repository functions as an aggregator and search portal of scientific and educational information;
− in Portugal, a network of scientific repositories with integration into the research management information ecosystem is being developed.

The formation experience of national repository in China is of interest (Lingdan, 2021). It aggregates resources according to two levels of educational disciplines. The first level displays 114 subjects, the second − 404. This approach helps to find the necessary materials in certain disciplines more quickly.

The formation of national repository of academic texts in Ukraine has been initiated. The regulation of its work was approved by the order of the Ministry of Education of Ukraine dated July 4, 2018. It is assumed that the creation of the national repository will become an innovative platform for the development of science and education. However, so far, the authors of this study have not found, for example, the reflection of open textbooks in the repositories of text OER.

In the Ukrainian scientific and educational space, the most common are *institutional repositories*, which store the results of scientific research, educational materials and other forms of intellectual production of employees of a scientific or educational institution. The variety of content in digital institutional repositories provides various opportunities for its use in the process of training a future specialist. The experience of their implementation is sufficiently and multifacetedly covered in professional publications. However, the use of repositories by teachers and students in the crisis period, in the period of distance education, has not been sufficiently investigated.

In the course of our research, we paid attention to the use of resources of the institutional repository in two technical universities in Kharkiv and one in Mykolaiv, which are in the zone of

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active hostilities during the martial law in Ukraine. The library staff performs the formation and support of institutional repositories in the universities under study. The repositories of the Kharkiv National University of Radio Electronics (NURE) and the Admiral Makarov National Shipbuilding University (NUS) are open, and access to the institutional repository of the National Aerospace University named after M. Ye. Zhukovsky "KhAI" is organized in the local network. Students of all courses and faculties actively use the resources of the KhAI repository. This is evidenced by a survey of 1,611 students regarding the quality of distance learning and, in particular, the use of digital educational materials. Most of them (82.2%) consider the provision of digital educational materials to be sufficient, while 13.7% of students expressed dissatisfaction with the organization of distance learning in general.

The use of open repositories of NURE and NUS during 2019-2022 by teachers and students is increasing. This is evidenced by the data in the Table 1.

Table 1

Dynamics of Appeals of Teachers and Students to Open Repositories of the NURE and NUS during 2019-2021

Year	University			
	NURE		NUS	
	Number of documents	Appeals	Number of documents	Appeals
2019	9738	18582	900	1875
2020	12912	25929	3700	2561
2021	17241	36836	3982	4636
2022	19366-	-	4973	8058

It is worth noting that Mykolaiv and Kharkiv have been in the zone of active hostilities since the first days of Russian aggression. The educational process in the universities under study in the last six months has been organized solely in online form. And it is during this period that users' access to the repository resources becomes more active. In particular, there has been a significant increase in replenishment and use of open access resources stored in the institutional repository of the NUS http://eir.nuos.edu.ua/xmlui/ (Table 2).

Table 2

Growth dynamics of OER placement and use in the NUS during the pandemic and martial law in Ukraine

Year	Number of documents	Use	Educational and methodological works and/or scientific works	Qualifying works of students
2019	900	1875	879	21
2020	2300(+1400)	2561	1290	110
2021	3141(+841)	4636	593	248
1st half of 2022	4057(+916)	8058	841	75

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Analyzing the usage statistics of NUS institutional repository during the pandemic and martial law in Ukraine, the increase in the number of visits can be clearly observed. This is caused by the current circumstances, namely the fact that the majority of scientists, teachers, and students were forced to work remotely.

From the first days and throughout the year, there were interruptions in the work of the NUS website and its Scientific Library, the Electronic Catalog of the National Academy of Sciences did not work, students passed the session and defended their qualification works online, while access to the repository practically did not stop. Thus, students and scientists were able to obtain the necessary open access resources in the institutional repository of the NUS (Table 3).

Table 3

Use analysis of the NUS repository

Year	Students	Teachers
2019	275	1600
2020	661	1900
2021	1886	2750
2022	4058	4000

It is worth noting that repositories generally have a multidisciplinary or thematic aspect. Repositories of information and library issues are of particular importance among *thematic* ones. Libraries, in particular university libraries, demonstrate commitment to openness, support the formation of institutional repositories, actively implement modern technologies and services.

The international repository E-LIS is widely known. In total, there are 120 repositories of information and library direction. The largest number is in the USA (17) and the leading European countries: Great Britain (12), Germany (9), France (6). Considerable attention is paid to the creation of LIS repositories in India (5), Brazil (4), Italy (3).

The status of the use of open educational resources and the creation of new ones by teachers of European universities, in which specialists are trained according to information and library programs, was determined within the DECriS international project (Mičunović, Rako, & Feldvari, 2021). The project is being implemented by the joint efforts of experts from the Faculty of Humanities and Social Sciences, University of Osijek, Croatia, Stiftung Universität Hildesheim (Germany), Universitat de Barcelona (Spain), Universitet po biblioteknoznanie i informacionni tehnologii (Bulgaria), University Computing Centre, University of Zagreb (Croatia). An important stage in the project implementation was the survey of specialists from 23 European countries by means of a questionnaire. Respondents from 56 universities took part in filling out the questionnaire, including the teachers from 3 Ukrainian higher education institutions, which train specialists in specialty 029 "Information, Library and Archival Affair".

According to the results of the DECriS international project during 2019-2020, 52% of European LIS universities/departments used digital OER. The researchers found that Teachers and trainers at LIS schools/departments find OERs mostly in OERs repositories (29%) or directory sites (23%). Some of them (16%) find OER through specialized OER search engines (Mičunović, Rako, & Feldvari, 2021, p. 43).

Teachers not only used ready-made products, but also formed them:

− 38% ☐ by their own;

- − 16% ⬜ in cooperation with the library;
- − 9% ⬜ involved students in the development of educational materials;
- − 7 % ⬜ based on partnership within joint international projects;
- − 7 % ⬜ together with teachers of other departments.

These figures show that the process of promoting OER requires development.

In LIS universities in Italy, digital educational documents, which are placed in the Moodle system, are often used as OER. In addition, teachers use educational materials developed by other authors and offered at the national or international levels (Tammaro, 2020).

The research results of Chinese authors show that despite the constant increase in the number of teachers (63.2%) and students (75%) who refer to library resources during distance learning, 28.9% of teachers and 26.6% consider the library as a platform for online courses (Zhou, 2021). At the same time, other authors note that digital OERs are becoming an important activity of the university library not only as information and library resources, but also as the main elements for the development of new academic disciplines, educational programs and innovations (Markin, 2021; Kolesnykova, 2019). The important role of university libraries in the promotion of online courses is emphasized (Tammaro, 2020). Indeed, one can agree with researchers that libraries mostly provide access to educational documents, and the involvement of library professionals in the OER creation is only becoming more widespread. This is what demonstrates the growing role of the library in the society of knowledge.

Conclusions

The development of distance education has caused a burst of attention to open access digital resources and open educational resources. One of the places of their storage and use are repositories of various levels: international, national, local. At the local level, institutional repositories are being developed. Both multidisciplinary and thematic repositories are being formed at all levels. Among the thematic ones, repositories of the information and library profile are of great importance, as they are aimed at training future specialists and improving the qualifications of library workers. In the processes of storage, systematization and formation of open access and open educational resources, the role of the library is growing. The library is becoming one of the most important online learning platforms. The priority perspective of the university library at the current stage is the convergence of library activity with educational activity, not only in the aspect of organizing access to open educational electronic resources, but also their creation and planning. An in-depth study of the cooperation of library specialists with teachers and students in the direction of creating open educational resources is urgent.

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SHEMAIEVA H. V.
Кафедра документознавства та української мови, Національний аерокосмічний університет ім. М. Є. Жуковського «Харківський авіаційний інститут» (Харків, Україна),
e-mail: annashemaeva@ukr.net, ORCID 0000-0002-1053-989X

KOSTYRKO T. M.
Наукова бібліотека, Національний університет кораблебудування імені адмірала Макарова (Миколаїв, Україна), e-mail: tamara.kostyrko@nuos.edu.ua, ORCID 0000-0002-4175-9975

Формування та використання ресурсів відкритого доступу в університетських бібліотеках в період пандемії та воєнного стану в Україні

Мета дослідження. Дослідження спрямовано на розкриття репозитарію як важливого інструменту зберігання та просування ресурсів відкритого доступу й відкритих освітніх ресурсів (OER) як складової

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частини ресурсів відкритого доступу та ролі бібліотеки в цих процесах. **Методика**. Для досягнення мети дослідження було застосовано комплекс наукових методів, зокрема аналізу і синтезу, порівняння, статистичного методу та безпосереднього вивчення практичного досвіду шляхом аналізу бібліотечних звітів. **Результати.** В процесі дослідження було: узагальнено інформацію стосовно ресурсів відкритого доступу зокрема OER; розглянуто приклади національної політики формування репозитаріїв; вивчено досвід формування та використання інституційних репозитаріїв в технічних університетах м. Харкова та Миколаєва; розглянуто зарубіжний досвід створення та функціонування репозитаріїв інформаційно-бібліотечного профілю. **Висновки.** Обґрунтовано подальший напрям університетської бібліотеки в просуванні ініціативи OER, а саме: зближення бібліотечної діяльності з освітньою в аспекті створення, планування та організації доступу до відкритих освітніх електронних ресурсів.

Ключові слова: ресурси відкритого доступу; відкриті освітні ресурси (OER); університетська бібліотека; національний репозитарій; інституційний репозитарій; LIS репозитарій; COVID-19; воєнний стан в Україні