



Using Open Scientific & Educational Resources to Improve Research Competence & Quality of University Teaching Staff

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Abstract

The dynamic development of modern information technologies and the electronic form of data presentation opens up new approaches to information resource management and an opportunity to organize the processes of publication, storage, and distribution of scientific research of university teaching staff at a qualitatively higher level, by accessing the current state of the utilization of open scientific and educational resources (OSERs) in their professional activities. The study presents a theoretical analysis of scientific developments on the issue of using OSERs and open-access systems (OAS). The results show that electronic professional periodicals, digital libraries, online conference platforms, scientometric databases, electronic social networks, and systems of digital identification of scientists and scientific publications are the OSERs most frequently used by university faculty. Moreover, the vast majority of university faculty are aware of the need to use OSERs in their own professional activities. From the overall results, professional advancement and internship programs for university teachers require further improvement. The issues of the selection, technical integration, and organizational and methodical introduction of information-analytical systems to support scientific research remain topical.

Disciplinary: Education Management, Applied Information Technology.

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1 Introduction

In the modern conditions of intense competition between higher education institutions, there is a range of critical tasks of information and communication support for the educational and scientific activities of the teaching staff, including:

- exchange of experience and cooperation of researchers to accelerate the results of scientific research;
- assessment of the professional activities of research and pedagogical staff and the productivity and efficiency of their research, including citations of published scientific papers;
- the need to enhance the motivation and interest of participants in the educational process regarding the use of electronic scientific and educational resources and services.

One approach to solving the above problems is the use of open scientific and educational resources (OSERs) – automated information systems containing mainly educational and scientific information, which provide information support for education and research and technologically utilize computer information and communication platforms for transferring and processing information objects (Dneprovskaia & Shevtsova, 2019).

The introduction of such electronic systems and services into university education and research practice requires the research and pedagogical staff to have the corresponding competencies, including information and research competence.

Information and research competence (IR-competence) is understood as an individual's ability to use the information and digital technology to organize, plan, conduct individual or collaborative research, as well as to evaluate and implement research results and monitor such implementation based on the acquired knowledge, skills, and experience (Leshchenko et al., 2021).

The development of this competence involves obtaining new experience in using information and digital technology through purposeful training, professional development, self-development, and self-improvement of university teaching staff.

2 Literature Review

The theoretical and practical aspects of the creation and use of OSERs have been researched by a considerable number of scientists.

Coyle (2002), Kachan et al. (2018) and Tsay et al. (2019) explore various OSER models that utilize open-access systems (OAS): digital libraries (DL), scientometric databases, tools for checking the texts of publications for plagiarism.

The problem of functional features and the main characteristics of software for the creation of DLs for higher education institutions is addressed by Shtepa (2016). The problem of using electronic scientific journals in the system of university library information resources as a pedagogical instrument and a means of scientific communication is researched by Rozina (2016). An analysis of the global experience of the functioning of scientific periodicals in the conditions of digitalization, as well as their indexation in specialized digital publishing services and scientometric databases, is provided by Stone et al. (2016).

Hasan and Abuelrub (2012) propose an assessment scale containing a set of main criteria and indicators of the quality of open electronic journal systems, which can also be used in designing, developing, and implementing particular OAS (peer-reviewed journals published by academic institutions and universities; digital libraries, etc.).

Prozorov and Sokolova (2017) identify the key functions of a digital library (archiving resources, ensuring the validity and relevance of data, providing tools for analyzing materials, identifying the scientific and educational institution and the researcher, integrating with social networks, encouraging users to share knowledge). As a result of an experimental study, the authors conclude on the need to formalize users' needs by establishing a user-focused DL design process.

Cabral and Huet (2014) analyze the experience of creating a model for scientific research quality assessment based on the analysis of DL resources. The researchers note that of greatest relevance are the problems of communication between researchers working in separate or related fields of science and education.

Sun and Yuan (2012) explore the evolution of digital academic libraries. It is established that libraries are transitioning from a digital repository model to one that provides a wide range of services, such as research data management, analysis and visualization of experimental data, creation of electronic portfolios of researchers and laboratories, library support for first-year and graduate students, integration of library content into institutional learning management systems, and provision of research network infrastructure. Other studies (Essmiller et al., 2020; Jadhav, 2011) report a positive experience of publishing university textbooks and manuals in open DLs.

Ozdemir and Hendricks (2017) provide a close examination of OAS. In particular, it analyzes the key scientific, technical, and organizational criteria for belonging to this set of information systems, identifies the types of electronic journals, and lists the available open and commercial software platforms. The study also proposes a "business plan" for the deployment of an electronic journal and considers the ways of its integration with other components of the IT infrastructure of educational institutions.

Ndungu (2020) states that the use of the Open Journal System OAS in the work of university libraries allows creating and distributing of new knowledge and introducing new scientific search methodologies. These approaches provide opportunities to fill the gaps in the existing traditional system of academic knowledge and integrate the processes of research and results publication.

Martín-Martina et al. (2018) systematize recommendations for allocating the journals that are least likely to publish an author's article, writing cover letters to publishers, responding to editors' comments, and improving rejected submissions. The article also identifies trends in the publication of scientific research that are already becoming a reality: the impossibility of all journals exclusively being free and open, the demand for expert and anonymous reviewing of articles, imperfection of the scientometric indicators of articles' impact, and the further development of OSER technologies.

Butler (2013) explores the issues of results reproducibility, research data management, citation metrics, the emergence of preprint variants, the evolution of new peer-review models, co-authorship conventions, and the use of scientific network sites; the problems of publishing in open access journals are also analyzed. The study concludes that, despite using different access business models, most journals review the submissions quite thoroughly.

Abbas (2015) studies popular software and Internet resources for checking the texts of publications for plagiarism, their performance and functionality are analyzed in detail, and recommendations of expedient tools that can be used by the editors of scientific journals are provided.

The development of the aforementioned OSERs brings to the surface the problems of forming IR competence in scientific and pedagogical workers. Scientific studies also contain synonymous concepts of research and digital competence.

There is currently a considerable body of research on this problem area. In particular, Davidson and Palermo (2015) study the formation of the IR-competence in undergraduate students, which is defined as a proven ability to carry out the activities of search, evaluation, saving, creation, and publication of educational information resources with the help of OSERs, as well as the ability to organize information and scientific communication between the participants in the educational process.

Glazunova et al. (2019) focuses on the use of OSERs for the development of research competence. The authors' approach to the development of this competence involves engaging students in the study of promising directions of scientific research, then analyzing the present state of the development of a problem area, and preparing and publishing their own materials. The results of the study demonstrate the effectiveness of using OSERs.

However, there is a lack of research on the use of OSERs in the professional activity of university teaching staff and the formation of their IR-competence. In our view, assessment of the implementation of OSERs by scientific and pedagogical workers in their professional activity will provide for some preliminary conclusions on the need to introduce specially developed methods of using OSERs into the training and advanced training of university teaching staff to improve their IR competence.

The study hypothesis suggests that the introduction of a specially developed method of using OSERs into the training and advanced training of university teaching staff will allow improving their IR competence.

The study objectives include:

- researching the present status of the utilization of ICTs by university teaching staff in their professional activities;
- selecting ICT tools that are expedient to be used for publishing and sharing the results of research conducted by university faculty, as well as exploring the attitude of university teachers to using such tools in their professional activities.

3 Methods

The developed research program is composed of the following stages:

- 1) the study of the status of university teaching staff's use of ICTs in professional activities;
- 2) the selection of ICT tools that are expedient to be used for publishing and sharing the results of research conducted by university faculty, as well as assessment of the attitude of university teachers to using such tools in their professional activities.

To identify the ICT tools that are used and can be useful for publishing and sharing scientific research results, as well as to explore university teaching staff's attitudes toward using such tools in their professional activities, an online email survey was conducted in May-June 2021 with 109 faculty members participating.

The sample of respondents includes different age categories with an approximately equal distribution (25-35 years old – 23 (21%); 36-45 years old – 23 (21%); 46-55 years old – 32 (29%); 56-65 years old – 27 (25%)). Only 4 respondents (4%) are 66 years old or older (Figure 1).

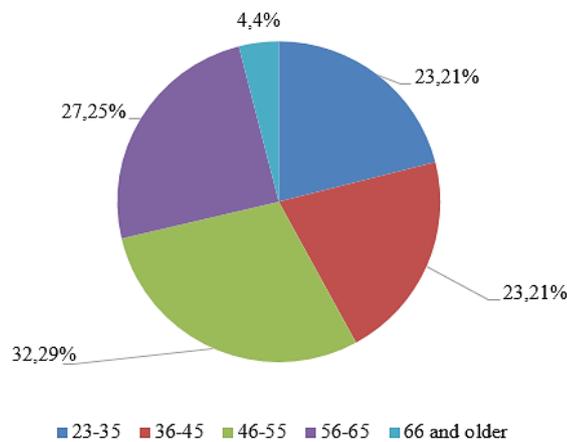


Figure 1: Distribution of the sample by age

The majority of the respondents (N = 43, 39%) have from 10 to 20 years of teaching experience, and approximately equal numbers of teachers have worked for 5-10 years (N = 27, 25%) and more than 20 years (N = 23, 21%) (see Figure 2).

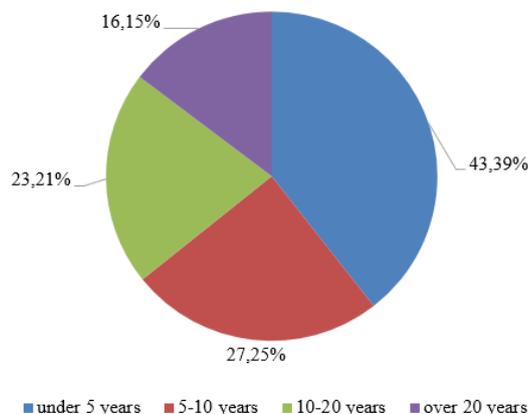


Figure 2: Distribution of the sample by work experience

The study participants were emailed with a request to answer the following questions:
What OSERs do you use in your professional activities?

What scientometric databases do you use in your research and pedagogical activity?

What cloud-based scientific and educational services do you use in your research and pedagogical activity?

For what purposes do you use OSERs in your research and pedagogical activity?

Evaluate your level of proficiency in the use of ICT tools in professional activities.

What OSERs do you consider the most useful in professional activities?

What research topics interested you the most while using OSERs?

The respondents were sent the same list of questions in Russian at the same point in time and were given 20 calendar days to respond.

Quantitative processing of the survey results is carried out via Microsoft Excel.

4 Results

The survey results indicate that among the OSERs most frequently used by university faculty in their work (Figure 3) are Russian digital science libraries and electronic professional periodicals (89% of the respondents), online conference/webinar platforms (79%), foreign digital science libraries (71%), as well as resources for creating personal scientist identifiers (61%). About half of the surveyed researchers use scientometric databases (54%), cloud-based scientific and educational services (50%), and blogs of scientists/educators, and websites of international projects (46%). Much fewer respondents use the information and analytical portals, systems, and directories (39%) and plagiarism checking systems (29%).

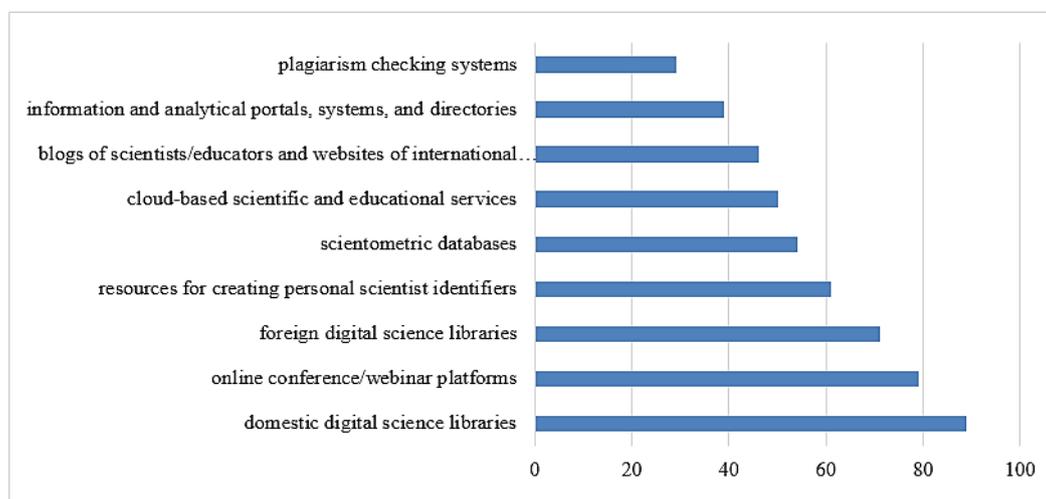


Figure 3: Results on the question “What OSERs do you use in your research and pedagogical activities?”

94 teaching staff members (86%) have a personal researcher profile in Google Scholar and Scopus, 74 of them (68%) have an ORCID identifier, and 35 (32%) have a Publons identifier (ResearcherID) (that is, some respondents have a ResearcherID “linked” to an ORCID). 15 (14%) respondents do not have a profile on any of the resources mentioned above.

23 (21%) of respondents use the Web of Science Core Collection, and 12 (11%) teachers use Scopus. 74 (68%) respondents do not use these scientometric databases at all.

Among the cloud-based scientific and educational services most commonly used by university faculty in their professional activities are eLIBRARY.RU (N = 109, 100%), Google (N = 78, 71%), Google Docs (N = 43, 39%), Microsoft Office 365 (N = 42, 39%), and One Drive (N = 35, 32%); the most popular social networks are Facebook (N = 97, 89%) and VKontakte (N = 47, 43%).

The typical purposes for which the university professors use OSERs in their professional activities include: searching for information on the research problem – 94 (86%); publishing research papers – 74 (68%); scientific communication – 70 (64%); holding seminars, web conferences – 67 (61%); collaborative work with colleagues – 55 (50%); collecting statistical data – 47 (43%); monitoring – 43 (39%); conducting surveys – 43 (39%); rating – 35 (32%); conducting distance learning – 32 (29%); creating websites and blogs – 20 (18%).

4 respondents (4%) report not using ICT for professional tasks at all.

The teaching staff’s self-assessment of the level of proficiency in the use of ICT tools in professional activities has distributed in the following way: sufficient level – 39 respondents (36%); partial proficiency – 55 respondents (50%); inadequate level – 15 respondents (14%) (Figure 4).

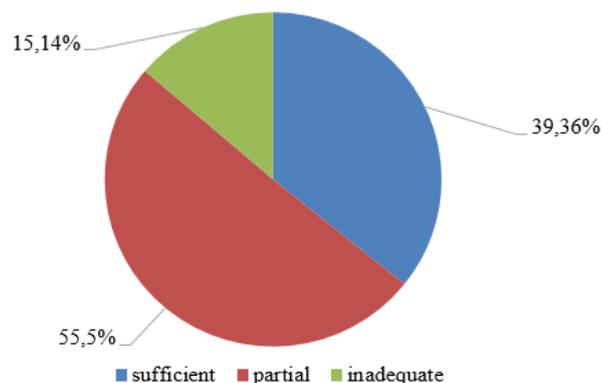


Figure 4: Results on the question “Level of proficiency in the use of ICT tools in professional activities”

Regarding the question of what OSERs are the most useful in professional activities, 74 respondents (68%) do not give any answer. Other respondents note the importance of using digital libraries (N = 20, 18%), electronic scientific periodicals (N = 12, 11%), Google and Microsoft cloud-based services (N = 12, 11%), and Telegram channels, Google Academy services, webinar and conference platforms, Ebsco, Cyberleninka resources, etc. (N = 4, 4% each).

While using OSERs, most teachers are interested in the following topics (Table 1).

Table 1: Results on the question “What research topics interested you the most while using OSERs?”

	N	%
didactic requirements for posting materials on such platforms		
the use of foreign libraries		
practical use of IT in scientific research		
the use of bibliographic managers		
Web 3.0 technology		
modern distance learning systems, SMART systems, and STEM education		
work with the scientometric databases Scopus and Web of Science		
ICT for the implementation of the results of scientific and pedagogical research		

5 Discussion

Analyzing the obtained results, we can state that electronic professional periodicals, digital libraries, online conference platforms, scientometric databases, electronic social networks, and systems for digital identification of scientists and scientific publications are the OSERs most frequently utilized in the work of university faculty. Based on the study results, we can also argue that the respondents (university professors) pay little attention to the use of information and analytical portals, software that automatically tracks textual matches and borrowings, and international project websites. In our view, this points to certain limitations of the reference base of their research, as well as to the fact that university professors do not always check their own publications for text uniqueness.

Meanwhile, the vast majority of the university teaching staff recognize the need to use OSERs in their professional activity.

Thus, it is necessary to ensure that each member of the university faculty is not only convinced of the need for systematic use of OSERs but is also aware of the exigency of conducting research using OSERs.

We believe that the introduction of a specially developed method based on the use of OSERs into the training and advanced training of university teaching staff, which, in turn, can become an object for further research, can provide for the improvement of their IR competence.

Such a method of using OSERs for the development of university faculty's IR-competence has to include the technologies of using digital science libraries (Sun & Yuan, 2012), electronic open journal systems (Ndungu, 2020), bibliometric, abstract, and scientometric databases (Tsay et al., 2019), electronic social networks (Coyle, 2002), and digital identifiers of scientists in Google Analytics (Martín-Martín et al., 2018). The described method will thus present a theoretically substantiated set of methods, approaches, techniques, and forms of using OSERs, the use of which by university teaching staff in research and pedagogical activity would strengthen their IR competence.

The objective of such a method would then be the development of the university faculty's IR competence by means of OSERs.

The goals of the method can be achieved by using a set of such forms of educational organization as lectures, seminars, training sessions, practical classes, consultations, and control activities to assess the learning outcomes. We agree with previous research (Khramtsov et al., 2020; Klimakina et al., 2020; Sokolova et al., 2021) on the fact that the scope of the use of such a method had to be determined by the university management independently based on the assessment of the teaching staff and resources that the university possesses.

Of no less importance is enhancing university teachers' motivation for the development of the IR-competence (Dneprovskaia & Shevtsova, 2019). In this regard, there is a need for pedagogical influence aimed at the development of the value and motivational component of the IR-competence, which shapes the conviction of the need for using OSERs in professional activity,

stimulates interest in obtaining relevant information on the opportunities to use them, and forms emotional readiness for systematic use of OSERs in conducting scientific research.

The introduction of the method in the process of improving the IR competence of university professors has to be accompanied by the use of technical means of education and freely distributed ICTs (Dudin et al., 2019; Leshchenko et al., 2021).

6 Conclusion

The study results give evidence that advanced training and internship programs for university faculty require further improvement. The issues of the selection, technical integration, and organizational and methodical introduction of information-analytical systems to support scientific research remain topical. The obtained results also support the hypothesis that the introduction of a specially developed method of using OSERs into the training and advanced training of university teaching staff will allow improving their IR-competence.

Prospects for further research are found in the development and practical approbation of a method of using OSERs for the development of the IR-competence of university teaching staff, which, as we argue, necessarily has to include technologies of using digital science libraries, electronic open journal systems, bibliometric, abstract, and scientometric databases, and electronic social networks.

7 Availability of Data and Material

Data can be made available by contacting the corresponding author.

8 References

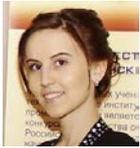
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