

Usability Evaluation of Web-Based Open Educational Resources in India: A review

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Abstract—The term Open Educational Resources (OERs) is used to describe a wide variety of technologies, materials, and procedures intended to make education and information more widely available. OERs are available for use in the classroom by instructors. There is a wide array of instructional resources that have been developed by other subject-matter experts and are suitable for use in the classroom. Since OERs allow users to retain, reuse, edit, remix, and redistribute content without seeking permission beforehand, educators can customize the materials they use in their classes to better match the requirements of their students. If the teacher makes use of OERs, they might inspire their students to learn more. Students now have the opportunity to acquire high-quality course materials thanks to the OER initiative. In this survey, several previous studies are studied based on usability evaluation of web based OERs. A comparative analysis is performed based on outcomes of previous studies. Also, in the work, researchers reviewed top OERs in India and revealed information about these resources. The findings of the research indicate that OERs in India provide information in the forms of audio, video, and text files using a variety of different file formats.

Index Terms— [Open Educational Resources, e-learning platforms, Massive Open Online Courses (MOOCs), Challenges for OER

I. INTRODUCTION

Open educational resources, often known as OER, have grown in popularity because of the many ways they may be used in the classroom and the classroom environment. For example, students are becoming more interested in web based OER like open courseware and massive open online courses

(MOOCs) because they help students connect with each other and let them learn from far away. OERs are educational materials that can be accessed by anyone in different ways, such as through text, audio, and video. OERs refer to a variety of learning settings as well as electronic and shareable resources that are available to the public. OER platforms come in a wide variety, ranging from learning materials based on the internet to stand-alone computer apps that might well be used in several learning environments [1]. Students not only use OERs to get information, but they also communicate with them by making, rearranging, using, and copying things from OER-driven environments. This understanding is at the heart of teaching methods that use OER, which makes it even more important for learners to talk with OER [2]. Even if new perspectives on OER are developing that are congruent with OER-enabled teaching methods, the problem of how already available OER supports the connections of students who have disabilities still needs to be answered. Even though, a new concept of OER requires learner-centered management of learning materials. The present debate on the position of OER in building skills appropriate for the 21st century has failed to identify solutions to include students with disabilities in the worldview. Specifically, it is not widely acknowledged that the existing OER can sufficiently accommodate the different interactions of learners with disabilities [3]. Fig. I represented the different initiatives of India as given below;

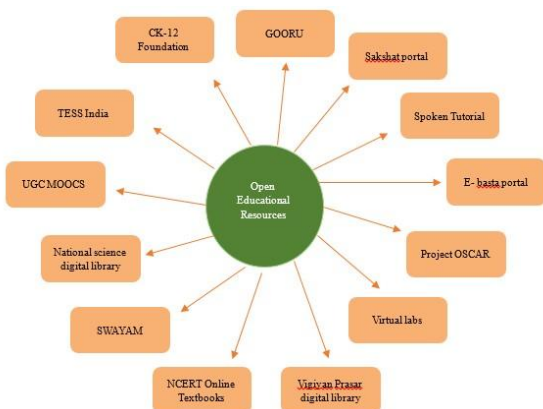


Fig. I. different OERs Initiatives in India [4].

Data produced by the National Centre for Education Statistics at the Institute of Educational Sciences (IES; NCES, 2020) [5] show that 13% of all students in the United States get assistance under the Individuals with Disabilities Education Act (IDEA), totaling 7.1 million persons. Ten percent or more of students with disabilities also do not spend more than 40 percent of their day in regular classrooms. This data suggests that students with impairments might find OERs particularly useful since they are less likely to have easy access to learning opportunities than students whose brains are developing normally. Research into open education is needed to determine how OER might be organized and implemented to maximize learning for persons with physical impairments [6].

1.1 Open Educational Resources

In today's contemporary world, OERs are the most cutting-edge kind of educational technology. The term "creative commons" refers to any kind of educational material that is freely available, might be easily accessed within the community, and might be employed on the condition that the user adheres to the terms of the associated license. OERs are freely available to everyone, and anybody might legally and generously copy and share the information, as well as use it however they see fit. OERs might take the form of lecture notes, textbooks, modules, course material, exams, projects, software packages, audio recordings, animated films, and video recordings. The many components of OERs are illustrated pictorially in Fig.II, which might be found here [7].

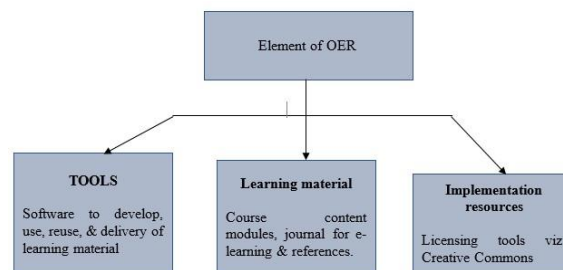


Fig. II. different elements of OER [7].

The primary definition of OERs is content or educational material that is freely accessible [8]. Regarding the field of education, OER represents an unsolved research challenge comparable to that of the Information and Communications Technology (ICT) sector [9]. OER has a few specific objectives and plays a huge role in improving learning and teaching practices [10]. OERs have a big effect on the field of study, especially in terms of what the results are. OER were made in the modern era when the education system was getting close to being cost-effective. At that time, there was a hope that OER would supply and produce information that was publicly or freely available to everyone [11]. Hence, it is reasonable to suppose that it would open a perspective for the purpose of shifting the traditional education system from one in which education is provided for a fee to one in which education is provided free of charge to all demographics of people who choose to become educated [12]. The practical and intellectual activity [13], technical expertise [14], and mathematical and engineering element learning [15] are some of the fundamental components that should be noted in open educational materials. Learners are allowed to do so in the activities based on the 5Rs [16] see Figure 3:



Fig. III. 5Rs of OER [17].

- a) Retain - Put together copies of the information and set some aside.
- b) Reuse - Use the information repeatedly, both now and in the future, and do it anywhere, anytime, and anywhere.
- c) Redistribute - Make changes to the material, and they will reflect across all languages.
- d) Remix - Connect the content of each resource.
- e) Revise - Communicate with other people using the integrated content.

Also, open lectures, open textbooks, open course materials, and open course frameworks are the most important parts of open educational materials [18]. It involves the creation of equal opportunities and information for all parties involved [19]. It has been fewer than seventeen years since the beginning of the creation of OER. In the last few years, its importance in teaching and learning has grown by leaps and bounds [20]. The concept of "zero freedom" refers to the theory of software architecture that holds that it should be simple and basic so that anybody could manage it. According to David Wiley and Wayne Hodgins, an OER learning object is a useful tool, and it has the potential to be reused.

1.2 Challenges for OER

The overarching goal of OERs is to both lower the cost of education by providing free access to superior educational materials and to broaden the availability of educational opportunities to anybody who is interested in doing so. These materials might be found on the internet for no cost and could be used for a variety of reasons, including instruction, education, and research. According to [21], students continue to have difficulty using online educational and research platforms to meet and react to the requirements placed on them by their research projects. It's possible that this is because the platforms itself were not very user-friendly. According to the findings of past studies, visitors would not use a website if it was difficult to acquire the content that it contains. Because of this, one of the most crucial factors for assessing whether a system would be accepted by users were whether it is accessible to OER platforms. The accessibility of OER platforms is essential to attracting users to such platforms [22].

II. LITERATURE REVIEW

In this section some related work based on usability of web based OERs is discussed below;

Cai et al., (2023) [23] investigated that how the usage of OERs by teachers is influenced by three kinds of variables: the quality of OER, teacher-related factors, and school-related factors based on the architecture of the integrated approach to behavior prediction. The data collected from 1,398 Chinese teachers was examined using multiple regression analysis and modelling using structural equations. The results of these analyses produced conclusions that were surprising and ran counter to the understanding of the problem that was stated in the earlier literature. Discussion is held on some suggestions for the future enhancement of OER adoption by teachers in Chinese K–12 educations.

Nicora et al., (2022) [24] addressed conceptual framework for the creation of OERs for online language teacher training along with an example of the actual application of this framework. The authors define the important aspects that contribute to the construction of successful OERs intended for the Lilac Project, which seeks to help language instructors in the management of distance learning settings, such as the concepts of micro- and macro-learning, different cognitive theories, and Threshold Concepts (TCs). The results of surveys and discussions held in focus groups were used to develop a collection of TCs related to online language instruction. They were then cross-referenced with existing TCs and used to generate micro learning material that does not adversely affect the cognitive load but, at the exact same time, is placed within a broader micro framework that allows for the acquisition of deeper knowledge and skills.

Trust et al., (2022) [25] provided a new way to use OERs in college courses that changed the game. It did this by getting students involved in the learning process by having them make OERs for a worldwide audience. The paper discusses the findings of post-course research that were gathered from 69 students in both undergraduate and graduate programs who participated in six various courses that featured OER graphic design. The results suggest that changing the roles of students from being consumers to being producers of OER increased motivation, enhanced

attitudes about learning, assisted in the accomplishment of course educational activities, and promoted the acquisition of valuable skills for success in the 21st century.

Yamba-Yugsi et al., (2022) [26] utilized MOOCs as both a source of information on the topic and as classwork, depending on how flipped classrooms were used. According to this strategy, OER has the potential to improve both standard high school curriculum and students' overall performance on standardized tests. 696 general education teachers with expertise teaching pupils in this setting were polled for this study. According to the findings, almost all teachers (93.9%) have trust in online education, 89% are ready to employ MOOCs as a teaching-learning resource, and 79% would use MOOCs as a component of the final grade. These results show that massive open online courses (MOOCs) have the potential to supplement standard elementary and secondary education in Ecuador. Hence, MOOC might help to improve educational outcomes and expand traditional education.

Ingavélez-Guerra et al., (2022) [27] developed a multi-tiered technical approach for the autonomous adaptation of OER, with the aim of developing a tool that increases the accessibility and precise use of OER information in digital classrooms. Disabled students are participating in studies to learn more about their actual wants and requirements. Study authors want to draw attention to the need of improving accessibility by emphasizing the importance of include appropriate subtitling in video content, as well as converting audio to text. To provide an informed suggestion, several pieces of information are necessary. The study's overarching goal is to give context that might be useful to individuals who develop and maintain open educational materials. It also hopes to help Artificial Intelligence (AI) application researchers take on the difficulties and opportunities of online education.

III. COMPARATIVE ANALYSIS

In this analysis, a comparative study is performed to analyses usability evaluation of web based OERs. The work of various authors is compared based on their outcomes as shown in table 1.

Table 1. Comparative Analysis.

Authors and Year	Techniques	Outcomes
Cai et al., (2023) [23]	OER	The findings were affected as a consequence, since only the subjective, self-reported survey data of the instructors was gathered and analysed.
Nicora et al., (2022) [24]	A conceptual framework	The designing of exercises and modules that may assist students in developing all four language skills was noted as a priority for instructors, with 47.6% of teachers indicating that they believe teaching speaking skills to students online is the most challenging aspect of their job.
Trust et al., (2022) [25]	Six different courses that featured OER design projects	The findings indicate that moving students from the role of customers to the makers of OER increased motivation, improved perceptions about learning, assisted in the accomplishment of educational activities for the course, and promoted the acquisition of valuable skills for success in the 21st century.
Yamba-Yugsi et al., (2022) [26]	MOOCs	Most instructors (79%) said they would include MOOCs into their final grade, and 93.9% say they have trust in online education.
Ingavélez-Guerra et al., (2022) [27]	A multilevel methodological proposal	the findings of this research indicate that, even though many contributions made throughout history have resulted in the creation of standards and laws that have stimulated research, there is still a shortage of automated instruments that favour optimum execution.

IV. TOP OPEN EDUCATIONAL RESOURCES IN INDIA

There are two main types of OERs that are available in India: audio-visual and textual. Most of the OER projects being made in India are for students in India's technical and vocational education and training (TVET), tertiary education, and lifelong learning programs. Students in India who are attending senior schools (K–12) and pupils who are participating in admissions competitions for technical education have access to a wide variety of e-learning goods and services. Both online and offline platforms might be used to offer e-learning content to students. Most of the available e-learning products are reasonably priced and designed with students from middle-class households in mind. The following is a quick categorization of and description of some of the Indian OER initiatives.

- National Programme on Technology Enhanced Learning (NPTEL)

Indian Institute of Technology (IIT) Bombay, IIT Delhi, IIT Guwahati, IIT Kanpur, IIT Kharagpur, IIT Madras, and IIT Roorkee are the seven Indian Institutes of Technology (IITs) that are participating in this effort, together with the Indian Institute of Science (IISc). The ministry of human resources development (MHRD) provided financial support for the undertaking. Its purpose is to improve the quality of technical education offered across the nation by making available straightforward access to curriculum-based video and online courses in the relevant sciences and engineering disciplines. Free online and video courses may be found on the internet, although certification programs can be purchased for a little charge. The lessons are broken down into fundamental ideas and other subjects that may be added on. The resources are made available under a Creative Commons license (CC BY-SA), and they are formatted in such a way that makes it possible to modify them in order to provide training for a variety of settings [28].

- Learning Object Repository of the Consortium for Educational Communication (CEC)
- The Collaboration for Educational Communication, more often abbreviated as CEC, is one of the inter-university centers that have been established in India by the University Grants Commission. It was founded with the intention of catering to the

requirements of the higher education sector by using the influential medium of television in conjunction with the effective use of developing information and communication technology (ICT). The students are provided with toll-free numbers in which the viewer could indeed place questions throughout live lectures; the classes are live on the SWAYAM Prabha educational platform, and the videos are also placed on YouTube and Facebook for a larger audience and greater prominence. CEC Gurukul live classes are presented by eminent educational researchers, and the students are supplied with toll-free numbers where the reader can put his or her queries during live lectures.

The National Mission on Education through Information and Communication Technology (NMEICT) is a project of the Ministry of Human Resource Development (MHRD). It is a once-in-a-lifetime chance for all of India's teachers and experts to share their knowledge for the benefit of every Indian learner and to close the digital divide as a result. In the context of this mission, an effort will be made to strike a healthy equilibrium between the production of content, the conducting of research in key areas connected to the delivery of education, and the establishment of connectivity to facilitate the merging of the understanding with that of developments in other nations. In accordance with the plan project of the NMEICT of MHRD, the CEC, in its capacity as an active partner, is working on the development of e-content course materials for undergraduate disciplines.

- Project Open-Source Courseware Animations Repository (OSCAR)

The IIT Bombay oversees Project OSCAR. It is a sizable compilation of what are known as learning objects, which are web-based interactive animations and simulations designed to educate students on a variety of topics related to science and technology. At both the undergraduate and postgraduate levels, LOs cover a diverse array of subject areas. Also, the program intends to provide students with training in the creation of learning objects (LOs), the administration of the backend of the repository, and the conduct of educational research.

- Online textbooks of the National Council of Educational Research and Training (NCERT) (<https://ncert.nic.in/>)

The National Council for Educational Research and Training (NCERT) has made school textbooks and reference books easy for teachers and students to find online through its website. The novels are written in all three languages: Hindi, English, and Urdu. The electronic books are downloadable on mobile devices and might also be viewed as flipbooks on the computer. The content is made available with a copyright notice, which places limitations on its future distribution and reuse [29].

- eGyanKosh of IGNOU

Learners get their education at India's Indira Gandhi National Open University, which is the country's most extensive distance-learning institution and the world's biggest open university. EGYANKOSH is a place where all the text study materials used in the many courses it runs are kept, and these materials are free for anyone to use. In addition to that, the video's page on YouTube has a selection of open educational videos that were shot in the IGNOU studio and shown on Gyan Darshan educational channels [30].

- National Digital Science Library (NSDL) of the National Institute of Science Communication and Information Resources

The National Science Digital Library's (NSDL) goal is to share all kinds of science, engineering, and technology (S&T) information with students all over the country. NSDL is the only one of its kind that provides curriculum-based content to address the information needs of undergraduate students of science. It was started as a Tenth Five Year Plan Network Project of the Council of Scientific and Industrial Research (CSIR), and it is the only organization in the world to do so. In order to provide students with access to information of a high standard, the process of developing and creating NSDL's content has been subjected to stringent protocols. NSDL's mission is to provide students with the highest-quality information possible by having it authored by experienced educators and evaluated by famous professors from Indian universities and colleges. Interactions between NSDL users have been made possible via the discussion forum [31].

4.1 File formats

There are a wide variety of presentation styles for educational materials. The following is a tabular representation of some of them in Table 2:

Table 2. File Formats of OERs

S. No.	Courses	File Format		
		Audio	Video	Text
1.	NPTEL	Mp3	Mp4	PDF and HTML
2.	eGyanKosh of IGNOU	–	–	PDF
3.	NSDL	Mp3	Mp4	PDF
4.	CEC	Mp3	–	–
5.	OSCAR	–	–	PDF and word format
6.	NCERT	Mp3	–	PDF and Hard copy notes

V. CONCLUSION AND FUTURE WORK

Courses, course materials, modules, textbooks, streaming videos, exams, software, and any other tools, materials, and procedures used to make knowledge more available are all included under the umbrella term OERs. Teachers are free to include OER into their lessons. There is a plethora of materials created by specialists in their fields that may be used as teaching aids in the classroom. Teachers may better cater to their students' individual needs with the help of OER since they enable users to keep, reuse, alter, remix, and redistribute information without first obtaining permission. Teachers who make advantage of OERs might find that their pupils are more motivated to study. The OERs movement has made it possible for students to have access to better textbooks. In this review, numerous research that focused on assessing the usability of online OERs are analyzed. Based on the findings of prior research, a comparison is made. Furthermore, the analysis disclosed details about the best OERs in India. File formats of all reviewed OERs in India are also investigated in the work. According to the results of the study, OERs in India make knowledge available in the form of audio, video, and text files which can be downloaded in a wide range of formats. In the future, researchers will continue to build on their work by suggesting a method for users based on their needs.

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