

Article

Open Educational Resources and Practices in China: A Systematic Literature Review

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Abstract: The concepts of Open Educational Resources (OER) and Open Educational Practices (OEP), regarded as two pillars of the broader open education movement, have been evolving since the concept of OER was first coined in the 2012 Paris Declaration. Several research studies have been conducted to investigate the impacts of OER and OEP adoption and implementation in universities. However, most of those studies have focused on western and developed countries, and little information is known about developing countries, especially Asian ones. Particularly, China was one of the first Asian countries to adopt open education and its related strategies following the MIT OpenCourseWare conference in Beijing in 2003. This study conducts a systematic literature review to investigate the current state of the art of OER and OEP in China. The findings show that several governmental, organizational, and institutional initiatives have been launched to facilitate OER adoption in China. They also show that while several OEPs have been implemented, there is still a continuous need to work on these practices and further investigate their impacts on learning outcomes and behaviors, as no current reviewed study has done so. Finally, a generic framework of OER and OEP challenges is presented along with recommendations to further enhance the adoption of OER and OEP in China.

Keywords: open education; open educational resources; open educational practices; China; policy

1. Introduction

With the rapid growth of technology, new forms of education have appeared. One of these is open education, a concept that encompasses multiple dimensions such as open access, open technology, open licensing, open educational policies, and Open Educational Resources (OER) [1]. The term Open Educational Resources was first coined at UNESCO's 2002 Forum on Open Courseware, and it was defined as "teaching, learning, and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation, and redistribution by others with no or limited restrictions". The usefulness of OER was further endorsed during the First OER World Congress in 2012 (Paris Declaration) and the Second OER World Congress in 2017 (Ljubljana Declaration), demonstrating the increasing worldwide interest towards the open education movement. In 2019, UNESCO released a recommendation focused on OER with five objectives: (1) building capacity of stakeholders to use, adapt, redistribute, and create access to OER; (2) developing supportive OER policy; (3) encouraging the development of inclusive and equitable OER; (4) nurturing the creation of sustainability models for OER; and (5) facilitating international cooperation on OER. In this recommendation, OER is defined as "teaching, learning and research materials in any medium that may be composed of copyrightable materials released under an open license, materials not protected by copyright, materials for which copyright protection has expired, or a combination of the foregoing" [2].

Despite the existence of critical views on the actual impact of OER (see, for example, [3]), there is general agreement on the potential of open content to increase access to and innovation in education systems. Shear, Means, and Lundh [4] stated that OER is one of the most significant teaching forms of the 21st century. Pomerantz and Peek [5] mentioned that the meaning of openness evolved in the late 20th and early 21st centuries, and thus its definition differs from one context to another. Specifically, in OER, openness means that a resource is freely available to use but the manner of its use is protected by intellectual property licenses. In other words, the OER movement introduced the idea of releasing educational resources (e.g., content, course designs) for anyone to freely access, retain (download, duplicate, store), reuse, revise (translate, adapt, modify), combine, and share under specific licenses, which, while offering no or limited restrictions, still recognize authorship of work. Wiley [6] introduced five principles of using OERs: (1) retain—each person has the right to make and own copies of the published resource through such means as downloading, storing, or duplicating; (2) reuse—each person has the right to use the content in different ways, such as in classrooms or on a website; (3) revise—each person has the right to revise the content and enhance it; (4) remix—each person has the right to create something new by combining the original content with other content; and (5) redistribute—each person has the right to share with others copies of the original revised or remixed content. Based on these five principals, openness is seen as part of a continuum rather than a simple binary choice (open versus closed). As the restrictiveness of the license for a particular resource increases, the granted permissions provided to users for that resource decrease and the less open the resource becomes [7]. The use of OER for teaching in an innovative and collaborative environment is referred to as Open Educational Practices (OEP). Ehlers [8] (p. 4) defined OEP as “practices which support the (re)use and production of Open Educational Resources through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning paths”. Research is converging on the fact that these practices can help enhance learning quality, access, and effectiveness in universities [9,10].

The OER concept was introduced to researchers and scholars in China in 2003. OER in China can be grouped into three categories [11]: OER which are not protected by Chinese copyright laws or any other open licenses but are publicly available by Chinese institutions and libraries for use without any fee; OER which are under an open license or protected by Chinese copyright laws that allow their free use and/or re-use; and OER which are not under an open license and do not reside in the public domain yet are made available for free public use by government policies.

While OER and OEP adoption is rapidly increasing in developed countries, it is lagging in developing countries due to several cultural, organizational, and technological barriers [12]. Specifically, little is known about the current state of OER and OEP in Asia [13]. Hu, Li, Li and Huang [12] stated that there is insufficient investigation of OER adoption in developing countries, including China, and that this should be changed, especially because understanding the cultural context of educational institutions within a country is critical to considering how to successfully mainstream OER [14,15]. To date, no systematic literature review has been conducted in Asian countries to investigate the current state of OER and OEP. Since China has several unique features, including cultural diversity, high population, a high number of schools, universities, and institutes, advanced technological infrastructure, and early adoption of OER since 2003, it provides an interesting case study of OER adoption in Asia. Therefore, this paper focuses on systematically reviewing the current state of the art of OER in China. The remainder of this paper is as follows: Section 2 presents the paper research methodology, Section 3 presents and discusses the obtained results, and Section 4 concludes the paper, with a summary of the findings and future research directions.

2. Methodology

Marangunić and Granić [16] state that a literature review helps in building the foundation for knowledge accumulation. This facilitates theories' expansions and improvements, closes research gaps, and uncovers areas on which previous research has not focused. Therefore, this systematic review is

conducted to understand the current state and progress of OER and OEP adoption in China. In this context, researchers and practitioners can easily refer to the findings of this study to understand the current OER situation in China and provide the needed interventions accordingly, for instance, by providing more policies to facilitate OER adoption in China. Additionally, international researchers and practitioners can use these findings to compare the current OER situation in Asia, specifically in China, with other regions such as Europe or America and then draw conclusions.

Specifically, this systematic review was conducted based on the main steps provided by Okoli and Schabram [17] as described below.

2.1. Investigated Research Question

To date, no systematic literature review has been conducted to highlight the current state of OER and OEP in China or Asian countries. Because of this, some clear and rather holistic research questions have been selected. RQ1: What policies and initiatives have been launched to support the adoption of OER and OEP in China? RQ2: What kinds of OEP have been and are being implemented in China? RQ3: What are the impacts of OER and OEP in China? RQ4: What challenges might hinder the use of OER and OEP in China?

2.2. Searching Strategy

To answer the above research questions, several search keywords were used. As shown in Table 1, these keywords are a combination of synonyms which can be categorized under the use of OER and OEP in China. The search was conducted in different electronic databases, including Taylor and Francis Online, IEEE Xplore Digital Library, ScienceDirect, Springer, Wiley Online Library, and ACM Digital Library.

Table 1. Literature search keywords.

Geographical Context	Educational Context
China	Open education
Republic of China	Open learning
Chinese	Open Educational Resources (OER)
	Open Educational Practices (OEP)
	Massive Open Online Courses (MOOCs)
	OpenCourseWare

2.3. Inclusion and Exclusion Criteria

The obtained results were then filtered based on the inclusion/exclusion criteria. A study was excluded if: (1) the original written language is not English (articles translated from Chinese to English were excluded to avoid any problems related to translation reliability); (2) the context of the study is not China; (3) the full text is not available online; and (4) the paper was discussing openness but not with an educational focus. The following typologies of studies were included: (1) journal papers, (2) conference papers, and (3) unpublished master and PhD theses. After searching relevant databases, two authors independently examined the obtained set of studies by title, abstract, and, if necessary, by full text in order to exclude articles that did not meet the inclusion/exclusion criteria. Particularly, the Cohen's Kappa was calculated to test the inter-rater reliability between the choices made by the two independent authors in selecting papers. The obtained inter-rater reliability value of K was equal to 0.88, which reflects a good agreement between the two authors [18].

2.4. Data Extraction and Analysis

Each study was then reviewed and examined based on seven items as presented in Table 2. These items provide information to answer the above research questions and to conduct the synthesis. Finally, a qualitative synthesis was conducted to answer the research questions presented earlier.

Qualitative syntheses are applied in several computer science areas, such as software engineering [19] and educational robots [20].

Table 2. Items used for analyzing the collected research papers.

Geographical Context	Educational Context
Authors	Author(s) of the study
Year	Year of publication
Type	Kind of publication, such as conference paper or journal paper
OER/OEP policies	OER/OEP adoption policy relevance of the study
Implementation	OER/OEP implementation relevance in China
Impacts	Description of impacts of OER/OEP implementation
Challenges	Description of challenges that might hinder OER/OEP adoption

3. Results and Discussion

As shown in Figure 1, the initial systematic search yielded 335 studies, but 87 of them were removed because they were duplicated. The remaining 248 studies were evaluated by title, abstract, and, if necessary, by full text. Twenty-four studies met the inclusion and exclusion criteria presented in Table 1 and were double-checked through a reading the full text. Figure 1 presents the full results of the review process. As shown in Figure 2, most of the conducted studies related to OER and OEP in China (14 out of 24) were published in recent years (2015, 2016, 2017, and 2018), which demonstrates the increasing interest of research on OER and OEP.

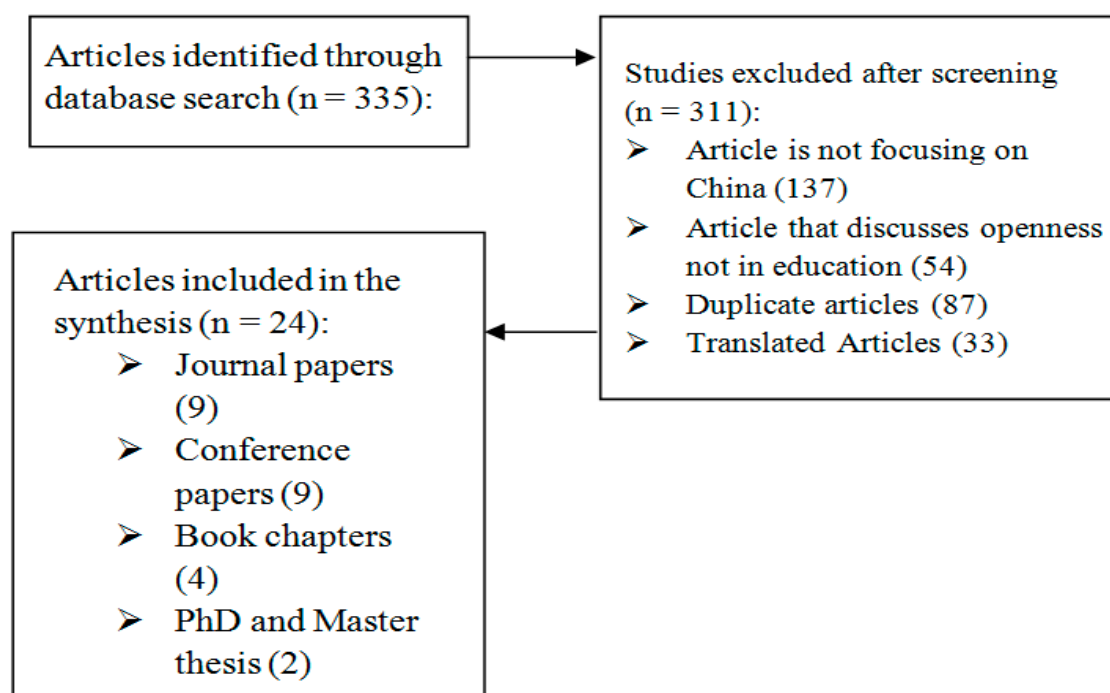


Figure 1. Flowchart of the systematic review process.

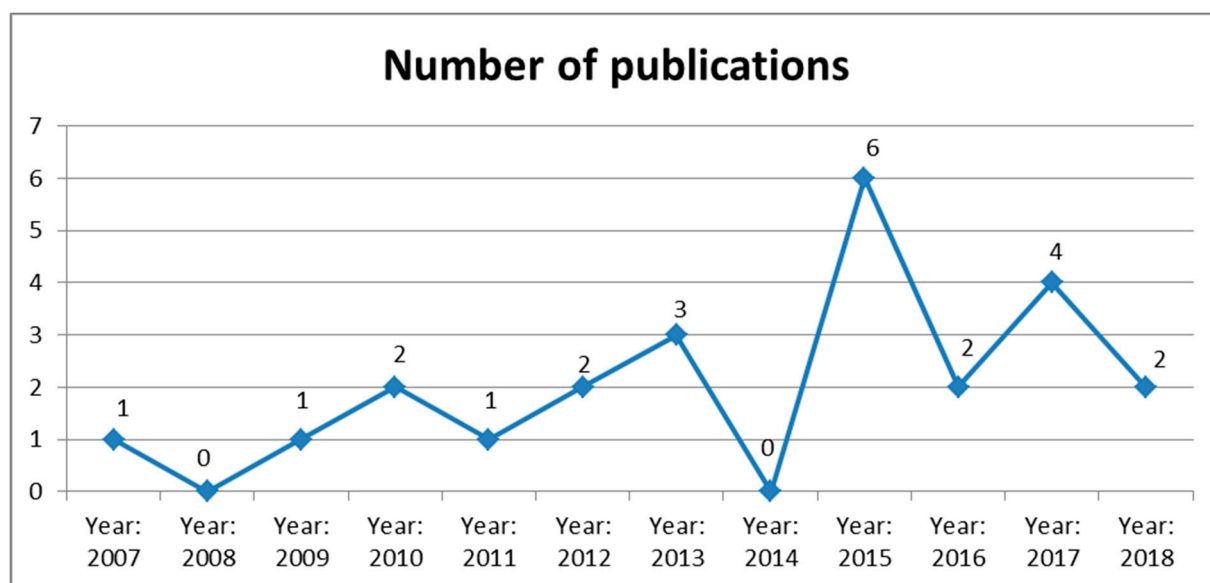


Figure 2. Time distribution of valid studies.

3.1. What Policies and Initiatives Have been Launched to Support the Adoption of OER and OEP in China?

Based on the reviewed studies, several governmental, organizational, and institutional initiatives and policies have been launched to support the adoption of OER and OEP in China, as described below.

On the governmental level, the Chinese government has launched three projects [11,12]. One of the first projects is the Chinese Quality Course (CQC), funded by the Chinese Ministry of Education in 2003, which aims to provide open courses and materials to the public without any restrictions. The Ministry ensured five years of funding for construction and maintenance to further support this OER initiative. Additionally, to encourage teachers to contribute to the CQC project, the ministry mentioned that CQC construction should be considered as one of the criteria for the assessment of teacher excellence. On the institutional level, several Chinese institutions have also launched initiatives to further support the CQC project by, for instance, providing bonuses (in addition to salary) for teachers publishing their courses within the CQC project. The second project is the National Cultural Information Resources Sharing Project (NCIRSP), funded by the Chinese Ministry of Culture and Finance, which aims to establish a network for Chinese people to facilitate sharing of cultural resources. This project aims to provide detailed information on the administrative procedure and method of obtaining financial aid for the construction of the public service system of culture in China. The third project is the Science Data Sharing Project (SDSP), funded by the Chinese Ministry of Science and Technology, which aims to provide a large public repository of scientific data and resources, especially for researchers, practitioners, and educators. Specifically, the ministry has released a set of standards and guidelines about public scientific resources that covers, for instance, the method of collecting and submitting data and resources in line with national intellectual property regulation.

At the organizational level, China Open Resources for Education (CORE) is a non-profit organization established in November 2003 following an MIT OpenCourseWare conference in Beijing and that has been involved in more than twenty projects related to OER adoption and sharing in China and abroad [21]. One of the projects of CORE is translating the Chinese courses published within the CQC project presented above into English. CORE aims also to help universities in managing their OER, as well as to establish collaborations between Chinese universities and international partners, such as the Open Education Consortium (OEC), the Massachusetts Institute of Technology (MIT), and the Western Cooperative for Educational Telecommunications (WCET).

At the institutional level, China Central Radio and Television University (CRTVU), under the direct administration of the Ministry of Education of China, has been pioneering the adoption of OER

in China [21] by publishing several open courses within the CQC project. It has also made use of its long experience in distance education by drafting course curricula, designing teaching plans, and developing tools that facilitate sharing courses online [21]. Additionally, CRTVU has provided several training programs to educators to help them design and publish their courses online. Additionally, the Open University of Hong Kong (OUHK) has actively participated in the OER movement by providing OpenCourseWare for learners using its online website (<http://freecourseware.ouhk.edu.hk>) and an external platform, iTunesU [22]. Additionally, to ensure the quality of published resources, including OER, the Open University of China (OUC) has developed a generic framework to address quality assurance. This framework covers 35 quality criteria across five quality domains, namely teaching resources development and management, teaching process management, learning support services, teaching management, and teaching and learning environment [23]. Furthermore, Guo, Zhang, Bonk, and Li [24] reported that several Chinese universities, such as Tsinghua and Shanghai Jiaotong Universities, have taken the initiative to build their own local Massive Open Educational Resources Courses (MOOCs) platforms such as “Xuetang online” and “CNMOOC”. McGreal [25] highlighted that despite the fact that in many cases the content of MOOCs is not released with an open license, these courses can be considered the offspring of the OER movement.

Figure 3 summarizes the above-presented initiatives and policies in China. China started supporting the use of OER from a rather early stage, following the MIT OpenCourseWare Conference in Beijing in 2003, by promoting policies and initiatives to facilitate adopting OER and OEP and putting in place the corresponding reforms. Specifically, it appears that different stakeholders, namely the government, associations, and universities, have been involved with facilitating OER and OEP adoption through the launching of several policies and initiatives. Jemni and Khribi [26] mentioned that providing good policies and involving several stakeholders could facilitate the adoption of OER and OEP in a particular country. Thanks to these policies and initiatives, several Open Educational Practices have been implemented in China as discussed in the next section.

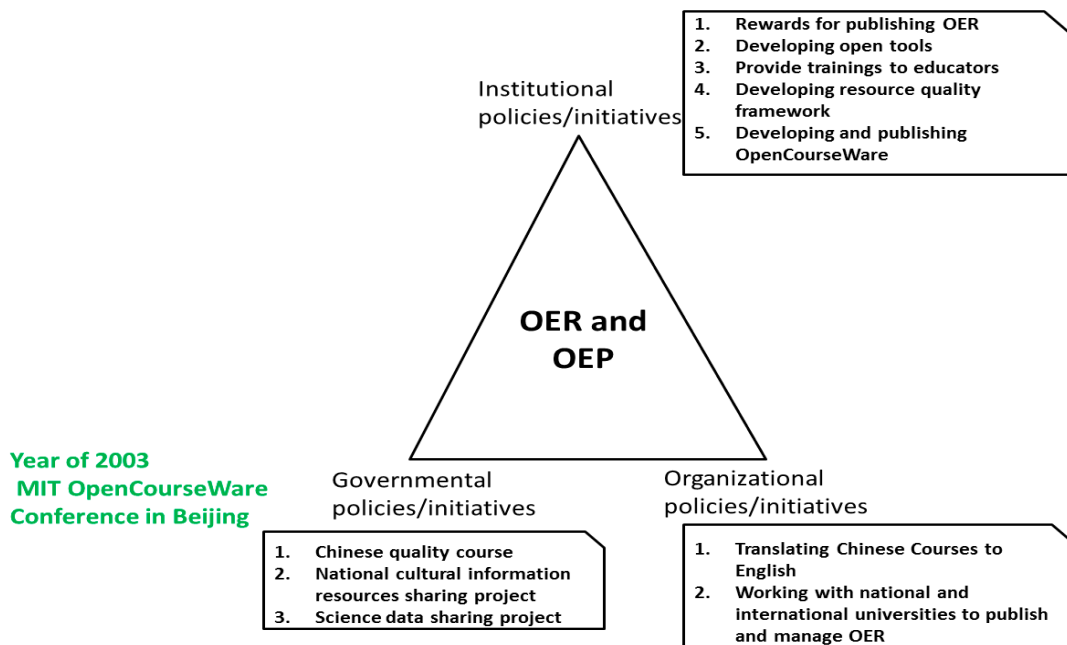


Figure 3. Open educational resources (OER) and open educational practices (OEP) policies and initiatives in China.

3.2. What Kinds of OEP Have Been and Are Being Implemented in China?

A number of Open Educational Practices (OEP) implemented in China have been identified by the reviewed studies. These OEP fall into three categories. The first is OpenCourseWare. As described

above, the CQC project encouraged several educators across China to create and share their courses online by allowing learners to access these materials and courses without any restrictions to re(use) them according to their open licenses [11,12]. The second is open tools. In addition to using international open platforms and tools such as Moodle or edX, China has developed open platforms/tools which are being used to provide open teaching. For instance, the microblogging platform Sina Weibo, which is similar to Twitter, has grabbed the attention of millions of Chinese users and has different functionalities, including (re)posting and responding to the comments of others [27]. Due to its popularity, Sina Weibo has been used in China as a platform to support collaborative work within Chinese MOOCs [27]. Other popular open platforms for MOOCs that have been developed and used by Chinese universities include XuetangX, CNMOOC, and iCourse163 [28]. These platforms provide several functionalities which can help educators create their courses and keep track of their students' performance. Pan and Bonk [29] highlighted that Chinese universities decided to reduce their financial expenses by developing open tools and software that can be (re)used by several universities to develop their courses without paying. They also mentioned that these open tools not only reduce costs but also engage students in collaborative learning opportunities. The third OEP is open teaching. Several universities in China, such as Peking and Tsinghua Universities, have started providing MOOCs for students and qualify as the most active universities in adopting MOOCs outside of North America [27,30]. In these MOOCs, students have to go through various interactive materials and assignments to learn, which is in line with the main international developments [31]. Additionally, several Chinese educators have taken teaching openness to the highest degree by using social networks within these MOOCs, for instance by engaging students in discussion via the social network Sina Weibo [27].

While several OEP have been implemented in China, other important practices remain yet unexplored or implemented, such as open data and open pedagogy [32]. For instance, open data could be used to enhance applied intelligent algorithms in learning analytics to achieve better learning outcomes. Also, open data could be used as OER within courses aiming to develop digital citizenship skills [33]. As far as open pedagogy is concerned, it should be noted that with the rapid increase of the open movement—especially in 2017, which was named by Bali [34] as the “year of open”—the definitions and understanding of OEP have evolved. For instance, there is continuous debate between researchers in the global north and south about open pedagogy [35].

3.3. What Are the Impacts of OER and OEP in China?

The collected impacts from the reviewed studies are classified according to the COUP framework [36]. COUP stands for: (1) cost—investigates the financial impacts of OER adoption and reform; (2) outcomes—investigates the learning impacts, such as academic performance, of OER adoption and reform; (3) usage—investigates ways of using OER; and (4) perceptions—investigates the opinions and feelings of learners as well as faculty members toward OER.

3.3.1. Usage

From the usage perspective, the Chinese Ministry of Education reported that during the five-year project of CQC, 1727 national-level quality courses were published online (171 courses in 2003, 299 courses in 2004, 298 courses in 2005, 358 courses in 2006, and 572 courses in 2007) [21,37]. Given the impact of the project, the Ministry of Education decided to continue working on it with a second phase that started in 2007. By the end of 2010, another 2053 national-level quality courses were produced and, altogether, more than 12,000 provincial-level quality courses and over one million institutional-level quality courses had been published. Shen, Ye, Wang, and Zhao [28] reported that 12 Chinese universities are providing over 154 MOOCs on international platforms, such as edX and Coursera, while 112 Chinese universities are providing over 593 MOOCs on national platforms, such as XUETANG and iCourse. These MOOCs cover several subjects, including engineering, philosophy, the arts, and agriculture.

Hu, Li, Li, and Huang [12] highlighted that 78.8% of students used OER, and among them 50.4% did so by accessing international OER websites. Specifically, most students reported that their main reasons for using OER were to meet their individual learning needs coupled with the possibility to access the content of well-known international researchers and scholars. Additionally, 60.2% and 45.1% of the students used OER videos and texts, respectively. Furthermore, most of the students reported that they used OER on a monthly or weekly basis, while a very small sample used them on a daily basis. Yawan and Ying [38] found that on the personal level, 49.2% of individuals have submitted learning content to be published as OER, while 67.7% are willing to. On the institutional level, 34.6% reported that their institutions have submitted learning content to be published as OER, while 57.7% mentioned that they are willing to. On the other hand, Li and Wong [39] found that most of students at the Open University of Hong Kong (OUHK) have limited knowledge and awareness of OER. Specifically, 45.2% of students stated that they knew how to use OER, but only three of them knew how to revise, remix, and redistribute it. Li and Wong [39] did not find in their study any significant correlation between computer literacy and OER awareness. Zhang, Perris, Zheng, and Chen [27] reported that several Chinese teachers used the social network Sina Weibo to deliver MOOCs, similar to what happens in other OER ecosystems [40]. Specifically, they found that the number of posts by students was high at the beginning of the course but decreased by the end of it. They also reported that several factors should be considered when using social media within MOOCs, such as the required number of posts and the balance between leisure and learning time. Sheu and Shih [41] highlighted the successful implementation of the open courseware project at National Taiwan University (NTU). Specifically, 26 new courses are added each year, and over 100 faculty members have actively participated in this project. Additionally, the number of visitors has significantly increased from 800 daily visits in 2012 to 8000 in 2016. In the same context, Huang, Lin, and Shen [42] and Huang and Shen [43] found that almost 72% of the users of the Opensource Opencourseware Prototype System (OOPS) in Taiwan are male, with the majority of users aged 20–25. Additionally, these users knew about OOPS through social media.

3.3.2. Perceptions

The perceptions of students and institutional authorities towards OER were investigated by Yawan and Ying [38]. They found that students believed that accessing OER could provide them with the best practices and learning contents, resulting in an enhancement of their learning outcomes. Students also thought that publishing OER would enhance their personal reputation and help them create new networks among friends and colleagues. The institutional authorities also had the same opinions about OER, believing that publishing OER can both enhance the reputation of universities and provide a learning opportunity for those who did not have a chance to continue studying after high school. They also believed that publishing OER could help them enhance their knowledge about a particular subject and build their own professional career. Similarly, Huang, Lin, and Shen [42] found that the motivations behind using the OOPS in Taiwan were an increase in knowledge about a given topic and enhancement of users' careers.

Guo, Zhang, Bonk, and Li [24] and Zhang and Li [44] investigated the perception of faculty members towards OER at Zhejiang University (ZJU) in China. They found that the majority of faculty had a positive perception about OER and were willing to publish their OER online. However, respondents had neutral opinions about the complexity and challenges of open content due to their limited expertise of using OER. Most faculty members also stated that certain individual factors could prevent them from publishing their OER, such as the needed time and skills.

Li, Zhang, Bonk, Zhang, and Guo [45] implemented an OER-based flipped classroom to teach "Internet and Distance Education" to Chinese undergraduate students at Zhejiang University. The course was divided to two parts: learning using videos as MOOCs on Coursera and an OER-related assignment. The obtained results showed that the students had positive perceptions about the course and they were happy and excited to be enrolled in it. Similarly, Lin and Wang [46] used OER-enhanced videos based

on TED talks in English-as-a-foreign-language (EFL) classes in northern Taiwan. They found that the students noticed the added pedagogical value of OER in learning. They also had positive attitudes towards using OER in English classes.

From the above results, it appears that Chinese educators have positive perceptions towards OER, as they think that these open resources can help them both to gain quality knowledge and to be innovative. These findings are consistent with the findings of Zhang and Li [44]. However, no investigation was conducted on the impacts of OER and OEP in China from the cost perspective. This could be because the Chinese textbooks are not very expensive, unlike the case in western countries such as the US. Additionally, while several developed countries investigated the impact of OER and OEP on learning outcomes (e.g., [47–49]), no study investigated this matter in China. In this context, Guo, Zhang, Bonk, and Li [24] stated that most OER studies in China focused on reviewing successful OER projects in the country and the encountered barriers, rather than analysing OEP and investigating the obtained learning outcomes. A possible reason for this can be that faculty members from developing countries still lack the needed skills to develop and publish their OER [50,51].

3.4. What Challenges Might Hinder the Use of OER and OEP in China?

Several challenges that might hinder the adoption of OER and OEP in China have been reported in the reviewed studies.

Technological infrastructure. Wang and Zhao [11] discussed that, in order to publish and adopt OER and OEP, technological infrastructure, including Internet access, is a crucial factor. However, this factor is not stable in a developing country like China where some regions and institutions have solid infrastructure while others do not. They further pointed out that several universities in China still could not adopt MOOCs in their teaching programs due to the limited infrastructure that they have.

Copyright. Yawan and Ying [38] found that most individuals do not want to publish their OER due to the fear of copyright infringements. Particularly, they found that most people and institutions publish their OER without an open license which defines how others should use these resources. Additionally, Yawan and Ying [38] found that most individuals are not aware of Creative Commons (CC) licenses and therefore do not use them. Similarly, Shen, Ye, Wang, and Zhao [28] reported that intellectual property has been found to be a problem in providing MOOCs.

Difficulty of finding OER. Yawan and Ying [38] highlighted that students find it difficult to locate OER due to lack of awareness about the university OER repository or international repositories. Additionally, Hu, Li, Li, and Huang [12] and Huang, Lin, and Shen [42] pointed out that most students found that OER websites were difficult to use due to their unfriendly user interface design, resulting in difficulty finding and downloading the published OER. Similarly, Wang, Ng, and Towey [52] found that most teachers in Hong Kong face difficulties in finding the appropriate OER with which to integrate their provided learning materials.

Lack of encouragement/recognition. Yawan and Ying [38] stated that most individuals avoid publishing OER because there are no incentives or recognitions by their institutes for doing so. For instance, publishing OER does not have any impact on their career progression. In this context, most universities, including Chinese ones, do not include publications in open access journals among the criteria to get promoted or to get publication rewards. Additionally, Hu, Li, Li, and Huang [12] reported that students from Zhejiang University did not receive any encouragements from the university members in order to publish OER.

Learning content quality. Students from Zhejiang University reported that most published OER are not of a good quality or they usually cannot find what they are looking for as OER (Hu, Li, and Li, 2015). Shen, Ye, Wang, and Zhao [28] pointed out that some published open courses have quality issues and are duplicated, especially those discussing Chinese cultures and arts. Li [53] stated that most universities are now evaluating the quality of their open online programs. Furthermore, Shen, Ye, Wang, and Zhao [28] stated that most open published courses in China are in Chinese; therefore, students might not find what they are looking for if they are looking for the learning content in English.

Fear of criticism. Yawan and Ying [38] highlighted that students and teachers avoid publishing OER because they fear the criticism of others, including their peers and colleagues. In this context, the published resources are open to anyone, and this can take individuals out of their comfort zone as they are not used to criticism.

Lack of awareness/skills. Hu, Li, Li, and Huang [12] found that students prefer not to use OER due to their limited experience in online and distance learning. Additionally, students are not fully aware of OER and its advantages, and therefore, they are not adopting open content in their learning processes [12,38].

Allocated budget. While the Chinese government has provided several funds to support OER and OEP adoption and reform, Chinese universities and institutes are still struggling to do so [11]. In this context, Yawan and Ying [38] showed that several universities did not allocate budgets for OER and OEP projects, and consequently, students and educators might find it hard to publish OER.

Personalized learning. Wang and Zhao [11] reported that, based on a conducted survey, students prefer different learning formats of the open courses published within the CQC project. Therefore, this should be taken into consideration to enhance the adoption of OER. They also pointed out that real-time feedback should be provided online for students learning to use open content to enhance learning outcomes. Additionally, Lin and Wang [46] showed that OER English videos were difficult for some students as they were not personalized according to their level of English knowledge. This made the learning process using OER videos difficult for some students.

To summarize, Figure 4 presents a generic framework of OER and OEP challenges in China. It is seen that all the above challenges are grouped under five dimensions. Fund-related challenges focus on the problems related to the budget to maintain OER/OEP projects. Since OERs are free and learners do not have to pay the registration fee like in traditional online learning environments, De Langen and Bitter-Rijkema [54] stated that this could be a major problem due to the absence of a revenue model to keep providing open learning. Wiley, Williams, DeMarte, and Hilton [55] also highlighted that there is an urgent need for universities to find a successful revenue model that can support the creation and publishing of OERs. Therefore, there is an important need to investigate the possible revenue models within OER projects. Environmental-related challenges focus on the problems found within a given environment which limit the adoption of OER or the implementation of OEP, such as the absence of university encouragement and recognition to publish OER or the absence of a good infrastructure which supports the OER movement. Therefore, universities should update their policies to keep up with the OER and OEP paradigm, for instance, by including open access publications as one of the criteria to get promoted. Legal-related challenges focus on the legal problems encountered when adopting or implementing OER and OEP. In this context, further awareness should be raised about the different copyright laws and open licenses available, as well as the consequences of the illegal use of others work. Individual-related challenges focus on the problems among individuals (e.g., educators or students) which limit them from using or implementing OER or OEP. For instance, as shown above, several educators could not publish their OER due to their limited skills in distance education or because they fear being criticized by others. In this context, further training should be provided to both educators and students to help them publish their own OER, as this would have a positive impact on other openness dimensions such as open course design, open pedagogies, and open assessment [56]. Additionally, several psychological factors, such as personality, should be further investigated to determine their correlation to using OER, since the choice of using open approaches strongly depends on personal cultural attitudes [57]. Currently, no research work has been conducted in China to investigate the relationship between personal attitudes and willingness to publish or adopt open education, including OER and OEP. Learning-related challenges focus on problems related to the learning content, such as the learning quality problem of the published OER, as well as learning experiences, since most provided learning experiences using OER fall under “the one size fits all” category without taking individual differences (e.g., learning style, level of knowledge, etc.) into

account. In this context, developing smart open learning environments would be needed to help provide adaptive learning experiences for all individuals and instant learning feedback when needed.

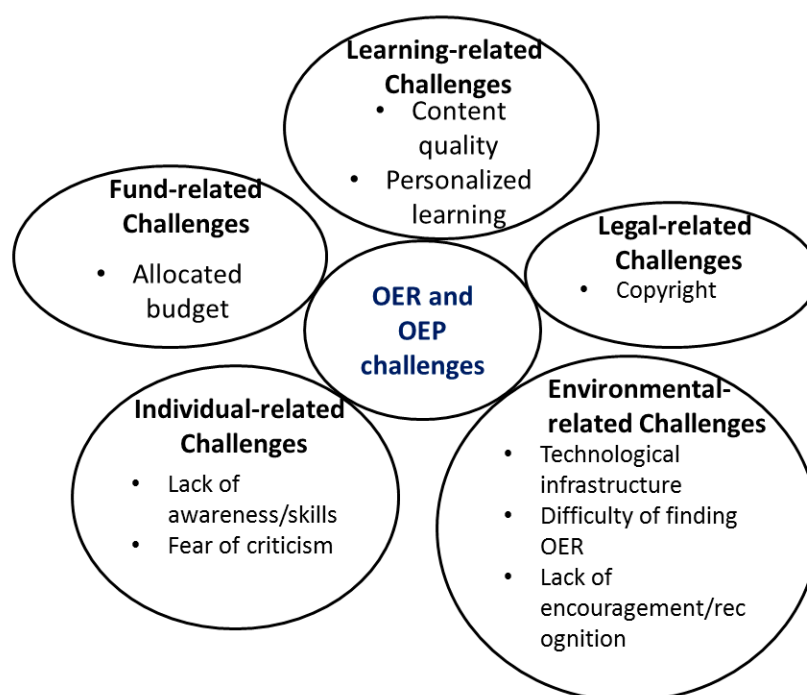


Figure 4. A generic framework of OER and OEP challenges in China.

4. Conclusions

This study conducted a systematic literature review to investigate the state of the art of OER and OEP adoption in China. The findings highlight that China started promoting OER at an early stage beginning in 2003, and that various institutional, governmental, and organizational policies and initiatives have been launched to facilitate the adoption of OER in the country. Consequently, several OE practices, such as Open Courseware, tools, and teaching practices have been implemented. This has positively affected the perception of both educators and faculty members towards OER. However, the analysis of the impact of OER and OEP on learning outcomes is still in its infancy, and further research should be conducted to see how OER and OEP can affect students' level of knowledge, motivation, and behavior. Finally, a generic framework of OER challenges in China, based on the reviewed studies, was presented. The findings of this study can help researchers and practitioners further work on the identified gaps to better facilitate adoption of OER and OEP in China and other developing Asian countries. Interestingly, the identified challenges are very much in line with the ones identified by a number of global studies of OER and OEP adoption [9,58,59], showing that the Chinese OER and OEP ecosystem, despite its particularities which must always be considered when making comparisons [60], is developing in a rather coherent way with respect to the mainstream open education movement. However, it should be noted that this study has several limitations that should be acknowledged. For instance, the review results are limited to the search keywords used, and thus some studies may not have been included. Also, this study is based on the findings from the literature review and is not supported by any experimental setup.

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