Application Status and Development Countermeasures of Hainan OER System

Yidong Feng[1,2], Junfeng Diao[1(✉)], Youhua Chen[1], Yizhen Zhou[1], and Junyu Zhang[1]

[1] School of Education, Hainan Normal University, Haikou, China
920268@hainnu.edu.cn

[2] Key Laboratory of Data Science and Intelligence Education Ministry of Education, Hainan Normal University, Haikou 571158, China

Abstract. Open educational resource (OER) plays a significant role in promoting the innovation of teaching mode and realizing the equity of education, as well as a prerequisite for realizing the digital transformation of education. At present, large number of provinces in China have established provincial OER system, but there are still quite a lot of challenges in the application, resulting in the waste of resources construction. This study takes OER system in Hainan Province as an example, adopts the application data of the resource system and questionnaire analysis method to conduct in-depth investigation of resource system application status and the demands of primary and secondary school teachers on resources, analyzes the existing problems, and puts forward the countermeasures of resource construction, in order to provide reference for the subsequent construction of the OER system in Hainan Province.

Keywords: OER · system · Hainan

1 Introduction

With the development of social economy, the growth of people's learning needs and the deep integration of information technology and education, the learning environment based on OERs has attracted increasing attention. In the entire field of education, the adoption of OERs is increasing. In 2018, China put forward the "Education Informatization 2.0 Action Plan", whose first action is to expand the digital resource services: to construct a national public service system of education resources, connect the national hub with the national public service platform of education resources and 32 provincial systems, realize the open sharing of digital resources, and form a comprehensive mechanism for the development and utilization of digital resources [1]. In fact, this is an open educational resource system developed by the state as the main body. In order to implement the "Education Informationization 2.0 Action Plan", Hainan Province has built a public service system for open education resources, the construction of which is a vital way to realize the distribution of high-quality resources throughout time and space and to realize educational equity.

MIT launched the Open Courseware Project (OCW) in 2001, which marked the beginning of the OERs movement. In 2002, UNESCO held the Forum on the Impact of Open Courseware for Higher Education in Developing Countries in France, and defined the concept of OER as teaching, learning and research materials provided in any media form (digital or otherwise) that are in the public domain or published under an open license that allows others to access, use, adapt and redistribute free of charge without any or limited restrictions [2]. The William and Flora Hewlett Foundation began investing in OERs to lower the cost of studying in the United States and to solve the problem of inadequate high-quality course materials [3]. The Hewlett Foundation saw an unprecedented opportunity to scale up OERs and unlocked its potential to improve education. Its funding has been supporting mainstream education adoption and effective use of publicly licensed educational resources to provide greater access to world-class education for students. It mainly includes the entire course, course materials, modules, textbooks, streaming videos, quizzes, software, tools, materials, or technologies that support knowledge acquisition. Modern higher education has a great demand for OERs. Studying the development of OERs has incomparable value to the ecology of higher education. As one of the most important educational innovations of this century, OERs also deduce different teaching practices. The Organization for Economic Cooperation and Development (OECD) divides OERs into three types: (1) Learning content: courses, courseware, modules, learning objects, collections, periodicals, etc.; (2) Tools: software that supports the development, use, reuse and delivery of learning content, including tools for searching, developing and organizing content, learning management systems, and online learning communities; (3) Implementation resources: intellectual property licensing, promotion of public release of materials, best practice design principles, and localized content[4]. MIT Open courseware is typically OER in the form of learning content, while open source software such as Moodle and Sakai are learning management systems. Creative Commons (CC) is a different type of license that facilitates the public release of material. Publications are increasingly using CC instead of traditional intellectual property [5].

In the construction and development of OERs, Britain has invested substantial educational funds in the construction of resources, providing teachers with high-quality teaching resource systems. The construction of digital resources in the United States is relatively comprehensive and relevant mechanisms are relatively sound. The US government attaches importance to and invests funds to promote the development of OERs. South Korea has developed a related evaluation system [6].

China has a nationwide OER system at the national level. Some provinces such as Yunnan, Jiangxi, Sichuan, Guizhou, Jilin, Fujian have also built provincial OER systems successively. The Hainan OER System was constructed and put into use in May 2021. Ever since the system being completed, some schools have been selected as model schools to promote the OER system and provide free teaching resources for teachers. At present, the functions of Hainan Province's system are under constant improvement, and the amount of resources is considerable. However, there are still multiple problems and deficiencies in the construction and application of resource platform, which require further study.

2   Materials and Methods

Questionnaire survey: The subjects of the questionnaire survey are the users of the Hainan OER system, teachers of primary and secondary schools in Hainan province. The questionnaires collect the teachers' demand for OERs and information about their current use of OERs in schools to sort out the application status and existing problems of users in OER system. The questionnaires were sent to primary and secondary schools in cities and counties of Hainan province. A total of 294 questionnaires were collected and all were valid.

   Data analysis method: Through data analysis of the system, including the user utilization rate, the number of times the dashboard is utilized, the number of times the resource is consulted and downloaded, the researchers gain insights of the needs of teachers in OERs and teachers' feelings of using the system.

3   Results

3.1   Analysis of the System's Main Functions

The Hainan OER system consists of six parts, which are Resources, Application, Space, Teaching and research, Classroom, History of the Party, and More functions. The core purpose of the system is to share resources and bridge the education gap, especially during the Covid-19 period. The functions of each part are: (1) Resources: A large number of government-purchased digital teaching resources are stored here, including courseware, teaching designs, case videos, test papers and other types of resources. Teachers can also upload OERs them-selves. (2) Application: The part is intended to facilitate teachers' teaching and digitalize their teaching process, promote students' development of moral education and physical education, and provide teachers with research platforms, and management tools. Virtual experiments and AI education can also be used by teachers and students to enhance their digital literacy. (3) Space: Personal and institutional users can set up pages and functions according to their unique needs. (4) Teaching and research: Teachers from various disciplines can do teaching and research across schools, exchange and learn experience from each other. (5) Classroom: Teachers can watch and evaluate other classes and put forward suggestions, which provides great help for the development of teachers. (6) History of the Party: Users can learn about the Party's history in this part. (7) More function: Links to other OER systems are available.

3.2   OER System Data Analysis

Monitoring data analysis: According to the monitoring data posted on the OER system, till April 2022, A total of 99,971 users have registered the space function, and the activation rate of teacher space has reached 77%. The total number of OERs has reached 1,336,579, over 96% are about nine main subjects (Chinese, English, Mathematics, Physics, Chemistry, Biology, Politics, History and Geography). The proportion of other disciplines is only 3.79%. Therefore, although the total number of OER system resources is large, the distribution of resources is uneven. It is also found that the top five cities

Table 1. OER application data frequency analysis.

Grade	1st download	Total number
Grade 2	11	2940
Grade 5	19	1300
Grade 8	7	2496
Grade 11	5	944

in activation rate are the ones whose teachers have participated in the training of OER system, which confirms that the training can promote teachers' activation and usage of the OER system.

Application data analysis of each function: This section mainly analyzes the application data of seven functional sections, which are Resources, Application, Space, Teaching and research, Classroom, Party history learning and More function.

Resources: The application data of resources on the system is collected from the page views and downloads. Take the Chinese subject data as an example, with the method of sampling, the resource application data of the second grade, the fifth grade, the eighth grade, and the eleventh grade were selected for comparative analysis (See Table 1.). It can be concluded that the current resource application rate of the OER system is low, and although the number is basically sufficient, few users download and use it.

Application: Six classifications have been made in the application function. From Table 2., it is apparent that the overall usage rate of the system is low.

Space: The data of personal space is mainly derived from the ranking of visits, the first user in terms of space access is only 455 visits, the second user space is visited 235 times, the third user space is visited 127 times. Only the top five users are visited more than 100 times, and the rest of the users are visited less than 100 times, from which we can conclude that the usage rate of teacher users' personal space is generally low. The corresponding data of school space is mainly derived from the ranking of the number of visits, the first place in the number of space visits is 1469 times, the second and third being 1260 and 989 times. Top 6 school space visits have reached 500 times, and the rest of the school visits are below 500.

Teaching and research: According to the data, there are only one excellent teacher studio in use, and the rest are either under construction or unused. In the application of teaching and research, 26 communities have been built, with 8 members and 12,222 visits. It can be concluded that teachers have a low utilization rate of teaching and research function.

Classroom & History of the Party: No usage data are available at present.

More function: The system is connected with the national OER system, not with the OER system of lower-level cities and counties. From 2021 to 2022, there are only 4 activities using the OER system as the carrier, the utilization rate of more function being low.

Table 2. Usage data analysis in the function category.

1.Intelligent teaching		2.Inltelligent learning		3.Intelligent evaluation	
Application classification	No. of times	Application classification	No. of times	Application classification	No. of times
Interactive classrooms	221548	Read together	8359	Student reviews	2312
Pre-class instruction	172067	Intelligent detection	50	Student Growth Profile	327
Educational material resources	44267	Online schools	37	Teacher development platform	318
Distinctive teaching courseware	4998	Boutique courses	15		
One lesson per teacher	3887	Digital Library for Primary and Secondary Schools	13		
Synchronous lesson preparation	2923	Safety education	8		
Intelligent detection	2241	Knowledge point resources	6		
Online grading	1836	Physical education, health education and art education	4		
Xueke net	1331	Moral education	3		
Homework	1278				
Examination paper bank	747				
Interactive micro-courseware	156				
Boutique courses	88				
101EducationPPT	58				
4. Intelligent research & training		5. Intelligent management		6. Other applications	
Application classification	No. of times	Application classification	No. of times	Application classification	No. of times
Excellent teacher studio	213	Notification	26916	Virtual experiment	29
Online teaching and research	175	Lesson schedule	10	Smart classroom	17
Resource bank	63			AI education	16

(*continued*)

Table 2. (*continued*)

4. Intelligent research & training		5. Intelligent management		6. Other applications	
Application classification	No. of times	Application classification	No. of times	Application classification	No. of times
Learning space	6			Micro-video teaching resource library	14
Thematic communities	3			Cloud platform	12
Department of teach and research	2			Creative community	2
Resource exploration	0				

4 Discussion

This survey is based on the construction of OERs to investigate the applica-tion status of Hainan OER system. The questionnaire is divided into four parts: the basic information (teacher's organization, professional title, major and sub-ject), the resource demand (resource preference, resource source, resource use link, resource characteristics), the construction and application of resources (OER construction on campus), and the application status of OER system in Hainan Province (teachers' application status on OER system).

4.1 Basic Information

Among the respondents, 53.80% teachers' organizations belong to township schools, 42.8% are county schools and 3.06% are schools directly under the Department of Education. Of the teachers who filled out the questionnaire, 41.84% were intermediate teachers and 38.78% were junior teachers. There are 54.08% of primary school teachers, 20.75% of junior high school teachers and 25.17% of high school teachers. Chinese teachers consists of 28.23% of all respondents, mathematics teachers 25.51%, and English teachers 12.93%.

4.2 Preference of Resources

88.78% of teachers like teaching courseware, 65.99% of teachers like multimedia materials (videos, pictures, sounds, etc.), 43.88% of teachers like case videos, and 42.86% of teachers like micro-lesson videos. Among all types, teaching courseware is the most popular OER by teachers, followed by multimedia materials (pictures, music, videos, etc.), while other types of OERs teachers have a similar degree of preference.

54.76% of teachers care most about the pertinence of resources when choosing OERs, hoping that these OERs can accurately match their teaching needs, and 22.45% of teachers pay more attention to the diversity and comprehensiveness of resources.

OERs for teachers are taken from multiple channels. 51.70% of teachers' OERs come from the national OER system, 47.96% of teachers' OERs come from Hainan OER system, 33.33% of teachers' OERs come from the supporting CD of textbooks, and 31.97% of teachers' OERs come from colleagues' sharing. It can be seen that when teachers are in need of OERs, their first choice is the national OER system, followed by the Hainan OER system.

As for the utilization of the OERs, 73.81% of teachers prefer using OERs in the class lead-in stage, and 70.41% of teachers tend to use OERs in the lesson preparation stage. 67.35% of teachers will use OERs in the content delivery part, and 58.84% of teachers will use OERs in the scenarios presentation. According to the analysis, most teachers prefer to use OERs in the above four stages.

4.3 OER Construction and Application

Most primary and secondary schools have built OERs while about a quarter have not. Among the schools that have created OERs, 90.37% of the schools contain teaching resources of various disciplines. 47.71% of schools choose Hainan OER system as source. Regarding the type of the OERs, 83.49% of the schools provide teaching courseware, and 46.79% of the schools provide electronics plans. 43.58% provide multimedia materials (pictures, videos, sound materials, etc.) and 41.28% provide micro-class videos. Nearly half of the schools that have built OERs have professional personnel to review and maintain the uploaded and stored OERs, and most other schools plan to build a team of personnel in charge. 67.69% of teachers think that school-based OERs database should be built, and 50% thought that districts (counties) and cities should provide OERs services suitable for teachers' needs. Besides 41.16% argue that provinces should provide resource services. At present, the main problems of the OERs include them not being modifiable, an excessive number of obsolete resources, the mismatch between resources and textbook version, etc. In this survey, 72.11% of teachers are willing to share the resources developed by themselves to Hainan OER system, and 49.66% of teachers are willing to share the resources developed by themselves to online course competition platforms. Among the platforms for teachers to share resources, Hainan OER system is the system via which teachers are most willing to share. 34.69% of teachers agree with the academic value of OERs, and 34.35% agree with financial rewards as an OERs sharing incentive mechanism. 29.25% agree with teachers' ranking on the system as a bonus in the evaluation of professional titles. It can be seen that recognizing the academic value of resources, financial rewards, and teachers' rankings on the platform as a bonus in the evaluation of professional titles can motivate teachers to share their own OERs.

4.4 Application Status of Hainan OER System

In this survey, it can be found that nearly half of the schools have organized training on how to use the Hainan OER system. 27.6% of teachers use the system every week,

and 50.3% of teachers use the system every month. 22.1% of teachers say they have never used the system before. 19.1% of teachers say they are familiar with the system, while 60.9% of teachers think they are a little familiar with the system. About 20.1% of teachers say they are not familiar with it. 30.95% of the teachers think that the resources of Hainan OER system are very rich, and many resources that meet their teaching needs. 57.82% of the teachers think that the number of Hainan OER resources is moderate and sometimes they can find the intended resources. 11.22% of the teachers think that the system resources are not rich, and it is difficult to find the resources needed. As for the diversity of OERs in the system, 41.15% of the teachers find it not satisfying. As for the description of whether the system is conducive to teaching, 38.77% teachers find the system not satisfying. As for the description of the practicability of the system, 40.81% of the teachers think it is not satisfying. In the description of whether the system operation is simple or not, 40.13% of the teachers think it is not satisfying. In the description of whether the system resources are novel or not, 44.22% of the teachers think it is not satisfying. It can be seen that teachers' satisfactory level with the Hainan OER system is moderate in terms of its advantages of teaching, practicality, operation and novelty. The inconvenient downloading of resources is the biggest reason why teachers do not use the system. The second reason is that the resources do not match the actual needs of students. In the survey, 87.41% of teachers are willing to upload their resources to Hainan OER system. 12.59% of teachers are unwilling to upload their resources to Hainan OER system.

5 Conclusions

5.1 Problems

Through investigation and analysis, the main problems in the construction and application of Hainan OER system include the following aspects.

Only a part of the teachers have participated in the training activities on how to use Hainan OER system. At present, some schools have organized training on how to use the Hainan OER system, but many teachers have not par-ticipated in the relevant training, and some even do not know the existence of the Hainan OER system. Nearly 40% of teachers complain that the operation of the system is not simple enough. It can be seen that the training of Hainan OER system is still at an early stage, and more teachers need to learn about the system in the future.

The registration rate of Hainan OER system is high but the use rate is low. Most teachers only register to complete the task, not because Hainan OER system can aid with their own teaching. The reason is that the number of re-sources in Hainan OER system is not enough, and the quality of resources is uneven.

The resources of different subjects are unbalanced. The system has the problem of unbalanced construction of subject resources. Resources in Chinese, Mathematics and English are dominate while those in other subjects like General Technology and Information Technology are rather scarce.

The number of high-quality resources is small. The number of resources on the Hainan OER system has not met the needs of most teachers. The number of browsing and downloading is particularly low, and the proportion of resources with high scores is

extremely low. Nearly 40% of teachers believe that the quality of resources in Hainan OER system is low.

OERs have poor pertinence and resources are not new enough. The re-sources need to be more targeted and easier to retrieve. In addition, the resources on Hainan OER system are not novel enough, with many taken from textbooks of outdated versions.

The external OERs is not all free. Many high-quality OERs linked to the system are not free of charge, which poses a burden for teachers in terms of economy and energy. In many cases, the free resources cannot meet the needs of most teachers.

The system operation is prone to technical problems. When teachers use the Hainan OER system, they often encounter some problems. The resources can be divided into two types, one is the resources introduced from outside, and the other is the resources uploaded by teachers in Hainan Province. While testing the download function, the resources uploaded by teachers in Hainan Province ex-perience failures for many times. There are also a few problems in logging in.

The system has no incentive mechanism. At present, cities and counties such as Wanning, Sanya, Wenchang and Lingshui have held OERs training ses-sions, but the usage rate of OERs is still very low. This may be because colleges and universities have no incentive to promote teachers to use Hainan OER system, that is, there is no incentive for teachers to use Hainan OER system to download resources or share resources to Hainan OER system. This is also one of the main problems of Hainan OER system.

5.2   Strategies

Schools implement the training of Hainan OER system and increase the popularity of Hainan OER system. Generally speaking, problems of the system rise from inadequate training of Hainan OER system. It is suggested that the training of Hainan OER system should be comprehensive, including application functions, operation methods, platform rules and mechanisms, etc. In addition, the province, city and county should promote trainings to ensure that every teacher knows the Hainan OER system and how to use it. In addition to the announcement issued by Hainan Educational Center, some other methods can be adopted for publicity. For example, teachers should publicize the Hainan OER system from mouth to mouth. Teachers who are skilled in using the Hainan OER system can join the group of lecturers to share with teachers from other schools in the region.

The system should purchase different types of resources according to teachers' pref-erences and needs. At present, the most abundant resource are teaching courseware and teaching designs, while the number of multimedia materials and other types of resource is small. Therefore, when purchasing resources, the Hainan OER system can purchase different types of resources according to the ranking of teachers' preferences for resource types to meet the needs of teachers, and pay attention to the classification of resource types when uploading resources.

The construction of subject resources should be balanced. In terms of resource con-struction, although it is neither possible nor necessary to achieve the same proportion of teaching resources in each discipline. The number of curriculum resources in Hainan OER system such as Information Technology, General Technology, Music, Arts and PE

is too small. Therefore, in resource construction, teachers in these disciplines should be encouraged to share their OERs or find and introduce more OERs in these subjects.

Hainan OER system needs to filter and retain high-quality resources. When looking for OERs, most teachers are concerned about the pertinence and matching rate of OER, followed by the diversity and content of OERs. If these resources are not of high quality and do not meet the needs of teachers, teachers will have to spend more time and energy to find other resources, or make substantial modifications to the resources. Therefore, Hainan OER system is recommended to filter the existing resources, eliminate the resources with poor quality, and increase the proportion of high-quality resources. In addition, when introducing resources, it is recommended to conduct sampling audit on resources to ensure the quality of resources. It is also helpful if schools establish school OER system and each discipline group is encouraged to collect and review high-quality teaching resources. The OERs are sorted and uploaded to the school-level OER system, which can guarantee the quality of OER from the school level. This undoubtedly reduces a lot of resource audit work for Hainan OER system.

Hainan OER system needs to increase the quantity of high-quality OER. Many teachers think that the number of resources in Hainan OER system is not good enough, and the OER stored in Hainan OER system are not targeted and novel enough. Most of the high-quality OER linked externally need to be charged before they can be used. Therefore, it is suggested that when the Hainan OER system is constructed in the future, more high-quality and novel OERs can be purchased, so that teachers can quickly retrieve the OERs needed for their own teaching, and improve the status of the Hainan OER system in the minds of teachers.

Hainan OER system should strengthen its background management. It is suggested that the Hainan OER system establish a corresponding background maintenance management mechanism to regularly check whether the system can function well and provide good overall use experience for the teachers.

Schools need to implement the incentive mechanism for teachers to use OERs. At present, many teachers' regard Hainan OER system as dispensable. The teachers have many ways to find OERs, such as subject websites, search engines, resources provided by schools, and so on. Some teachers even make OERs themselves. When the Hainan OER system appears, they see it only an alternative to find OERs and do not recognize its value in sharing and promoting knowledge. Therefore, if incentives are introduced as bonus items, such as cash rewards, recognition of the academic value of resources and ranking of teachers' performance, the Hainan OER system will be more attractive and popular.

6   Summary

This paper obtains relevant OERs construction and application status of Hainan OER system. Through questionnaire survey and data analysis, it can be concluded that Hainan OER system has problems such as low publicity, inadequate training, unbalanced development of subject OERs, low quality resources, and weak resource pertinence. In response to these problems, suggestions and countermeasures are put forward, such as increasing publicity, promoting comprehensive training content, purchasing high-quality resources, paying attention to resource classification and balancing development

of subject resources, to provide valuable suggestions for Hainan OER system and various schools at all levels.

References

1. UNESCO. Open Educational Resources. Available online: https://www.unesco.org/en/open-educational-resources (accessed on 16 Jan 2023).
2. Open Educational Resources. Available online: https://hewlett.org/strategy/open-educational-resources/ (3 Jan 2023).
3. Ministry of Education. Notice of the Ministry of Education on printing and distributing the Action Plan of Education Informatization 2.0. Bulletin of the Ministry of Education of the People's Republic of China 2018, 4,118–125.
4. OECD. Giving Knowledge for Free: The Emergence of Open Educational Resources. Available online: https://www.oecd.org/education/ceri/38851849.pdf (3 Jan 2023).
5. OCW. MIT Open Courseware. Available online: https://ocw.mit.edu/ (3 Jan 2023).
6. Liu Z. Research on Resource Construction and Application of Education Cloud Platform in Ningxia. Masters Thesis, Ningxia University, Yinchuan, 2019.