Chinese national optical education small private on-line course system

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ABSTRACT

In order to realize the sharing of high quality course resources and promote the deep integration of 'Internet+' higher education and talent training, a new on-line to off-line specialized courses teaching mode was explored in Chinese colleges and universities, which emphasized different teaching places, being organized asynchronously and localized. The latest progress of the Chinese National Optical Education Small Private On-line Course (CNOESPOC) system set up by Zhejiang University and other colleges and universities having disciplines in the field of optics and photonics under the guidance of the National Education Steering Committee of Optics and Photonics (NESCOP) was introduced in this paper. The On-line to Off-line (O2O) optical education teaching resource sharing practice offers a new good example for higher education in China under the background of Internet +.

Keywords: Higher education, Optical engineering, Optics and photonics, On-line to off-line, Small Private On-line Course, Resource sharing, Internet +, Talent training

1. INTRODUCTION

On March5, 2015, Premier Minister Li Keqiang put forward the concept of 'Internet +' in the 'Government Work Report', and mentioned that 'education is the cause of today and the hope of tomorrow; what is needed to do is to promote the fairness and the quality improvement of education'. On July 1, 2015, 'the guidance on the active promotion of the Internet + action' was issued by the State Council, which encourages schools to use digital education resources and educational service platforms, and gradually explores the new model of education via network as well as expanding the quality of education resources and promoting the fairness of education. It also encourages cooperation between schools and Internet companies to integrate the resources both on-line and off-line; and promote the sharing of academic education on-line curriculum, large-scale on-line open courses and other network learning models; and explore the establishment of the system of on-line learning credit identification and credits conversion; and promote the reform of the higher education service model.

In the context of the 'Internet +' era, the education informatization and the sharing of high-quality resources have been put on the agenda. Both 'the education information thirteen five plan' issued on June 7, 2016 and 'the 2017 education in-

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formatization work points' issued by the Ministry of Education of China (MEC) stressed the importance and urgency of accelerating the work of education informatization and the strengthening the quality and application of higher education construction. MEC asks the Higher Education Division and the Technology Division to take the responsibility to organize the work of the implementation of the on-line education, as well as deeply implement the 'views on the strengthening of the construction and management of the on-line curriculum by MEC and continue to encourage colleges and universities to open high-level on-line undergraduate courses.

The core task of education informatization is to promote the deep integration of the information technology as well as education and teaching, and to achieve the all-round innovation of educational ideas and methods. In the context of education informatization, as the carrier of a new era of education reform, information technology has become a powerful tool that develops and changes the traditional education. At present, with the help of Internet technology, more and more new teaching models emerge. As the representative of the on-line education, MOOC is large-scale open and autonomy. But from the perspective of higher education, its disadvantages are obvious, which including the arbitrariness of on-line learning, the lack of effective supervision and constraints and high dropout rate; no interaction between teacher and student, lack of humanistic care and invisible knowledge transfer. What is more, the campus culture cannot be inherited effectively, and students lack the sense of presence and identity. The new O2O teaching model combines the advantages of both the on-line education and traditional education—the abundant teaching resources on-line can be used by students, and teachers off-line can organize, supervise and guide students. Teachers and students can interact face to face and use QQ and WeChat to communicate with each other instantly. This new learning model which is teacher-led, student centered, autonomous and interactive—O2O teaching mode becomes the realistic choice for the 'Internet + higher education'. This mode can effectively solve the problem of MOOC, and is expected to become the 'New Normal' of education pattern in the information era.

2. NATIONAL OPTICAL EDUCATION STATUS

At present, the number of colleges and universities that have set up the discipline in optics and photonics is more than 200 in China. However, problems such as the uneven level of colleges, the uneven distribution of teaching resources and the low level of the sharing of teaching resources exist for a long time. High quality education and teaching resources (including teachers, teaching materials, laboratories, equipment, etc.) are concentrated in 15% top universities, while the number of their students only accounts for 10%. As a result, other 90% of the students in the ordinary institutions share the relatively scarce teaching resources. Besides the spontaneous needs to enhance the quality of the optoelectronic professional education, the role of the Internet on education is also very obvious. Therefore, in the context of 'Internet +', it is crucial to explore how to promote the deep integration of information technology and traditional teaching, develop new forms of education based on Internet, share teaching resources among more than 200 departments of optics and photonics so as to radiate the good resources from 15% to other 85% departments, and eventually improve the overall optical education teaching level for the undergraduates in china. In addition, although there is a vast mass of class resources of optics and photonics, the characteristic of the discipline knowledge of determines that the interaction between teachers and students is essential in the teaching process. Moreover, the level of schools and teachers as well as the training and knowledge of students are different. Therefore, in order to promote the complementary co-construction, share of the national optics and photonics discipline courses and enhance the deep integration of 'Internet + higher education' and talent training in a better way, the simply use of on-line and off-line teaching mode in China's college

optoelectronic discipline courses is not enough. It also requires the teaching model to be off-site, asynchronous, organized and localized.

3. MAIN WORK AND THE LATEST PROGRESS

In April 2013, MEC issued a notice of the establishment of 2013-2017 MEC higher education teaching steering committees (http://www.moe.gov.cn/srcsite/A08/s5653/201304/t20130416_150999.html). NESCOP is one of the committee, whose chairman is Prof. Xu Liu of Zhejiang University and the secretariat of which is attached to Zhejiang University. NESCOP has proposed to set up a project—the CNOESPOC system for optics and photonics discipline, to enhance domestic optical education. In reference [1], the concept of O2O teaching resource sharing system, CNOESPOC system and tele-experiment were introduced. In addition, the participants of CNOESPOC from fall 2014 to summer 2015 were listed. In this paper, the CNOESPOC website, metacourses, participating colleges and universities, students involved, distribution of participating colleges and universities in China's provincial map, activities carried out, achieved stage results since fall 2015 will be focused on.

3.1 CNOESPOC website and metacourses

CNOESPOC course network platform has been developed which is suitable for O2O teaching, the website of which is http://www.cnspoc.com/school/opt. The purpose is to combine resources of optics and photonics selected from the Chinese MOOC and other main courses with local characteristics and qualified teaching resources into an original meta-course whose content module is easy to be copied and changed. In addition, we encouraged resource receivers to localize the framework and content of the courses, and build their own on-line courses that are easy to organize and implement the off-line teaching. At present, CNOESPOC platform provides four recommended original metacourses (see Figure 1), the first three of which are also Chinese MOOC Course (http://www.icourses.cn/coursestatic/course_6800.html, http://www.icourses.cn/coursestatic/course_4265.html, http://www.icourses.cn/coursestatic/course_3965.html), the latter one is 'Applied Optics' opened by National Univ. of Defense Technology (http://www.cnspoc.com/course/43387.html).

Applied Optics (Zhejiang Univ.) | Principle of Microprocessor and Interface Technology (Zhejiang Univ.) | Applied Optics (National Univ. of Defense Technology) | Applied Optics (Changchun Univ. of Science and Technology)

Figure 1. Resource sharing metacourses and their corresponding providers in the CNOESPOC website

3.2 Universities and students involved

Table 1 shows the colleges and universities (with their logos given in Figure 2), the number of students participating in the CNOESPOC O2O teaching reform since the fall of 2015. CNOESPOC creates the class accounts for these schools to help them build independently their systems based on the metacourses. We also establish a management and mentoring team nationwide to strengthen the communication between the providers and receivers as well as the teachers and students through on-site meeting, on-line high-definition video interaction and off-line face to face teaching, etc.

Table 1 Colleges and universities participating in the CNOESPOC O2O teaching reform since the fall of 2015

Course	School name	Fall & winter 2016	Spring & summer 2016	Fall & winter 2017	Spring & summer 2017
Applied optics	Zhejiang Univ.		√		√
	Chongqing Univ.		√		√
	Xi'an Industrial Univ.		√		
	China Jiliang Univ.		√		
	Ocean Univ. of China	√	√	√	√
	Sichuan Univ.	√	√	√	
	Dalian Univ.	√		√	
	Nanchang Hangkong Univ.	√		√	
	Changchun Univ. of Science	√		√	
	National Univ. of Defense	√		√	
	Zhejiang Sci-Tech Univ.	√			
	Jiangsu Normal Univ.				√
Principle of microproc-essor and interface technology	Zhejiang Univ.	√		√	
	China Jiliang Univ.			√	√
	Changzhi Medical College	√		√	
	Jimei Univ.	√		√	
	Huazhong Univ. of Science	√		√	
	Quzhou College	√			
	Xiamen Institute of		√		
	Zhejiang Univ. City College		√		
	Minzu Univ. of China		√		
	Beijing Information Science		√		
	Participating schools numbers	12	10	11	5
	Participating students numbers	995	815	1133	591

Figure 2.Logos of the 20 schools participating in the CNOESPOC O2O teaching reform since the fall of 2015

3.3 Distribution map of participating colleges and universities

There were 20 schools including 985, 211 and regular colleges and universities participating in the CNOESPOC O2O teaching reform since the fall of 2015. The distribution map of the provinces where those schools are in is shown with red box in Figure 3. It can be seen that the participating schools are mainly concentrated in 14 provinces and regions in East China and North China. The other areas need to be further expanded.

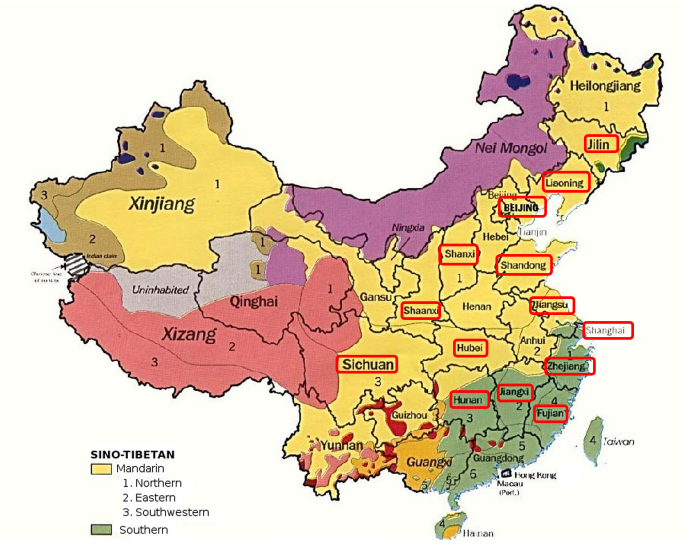

Figure.3 Distribution map of participating schools since the fall of 2015

3.4 Main activities carried out

Table 2. Main activities of CNOESPOC O2O teaching reform since the fall of 2015

Date	Activity	Cities	Participating schools
Oct. 29, 2015	interactive video conferencing	Hangzhou, Dalian, Changchun, Wuhan, Chengdu, Xiamen, Changzhi, Qingdao, Changsha, Nanchang,	Zhejiang Univ., Changchun Univ. of Sci-Tech, Changzhi Medical College, Dalian Univ., National Univ. of Defense Technology, Huazhong Univ. of Sci-Tech, Jimei Univ., Nanchang Hangkong Univ., Sichuan Univ., Ocean Univ. of China, Zhejiang Sci-Tech Univ.
Dec. 2, 2015	Cen and Li of Zhejiang Univ. taught in Ocean Univ. of China	Qingdao	Zhejiang Univ., Ocean Univ. of China
Jan. 7, 2016	Cen and Li of Zhejiang Univ. taught in National Univ. of Defense Technology	Changsha	Zhejiang Univ., National Univ. of Defense Technology
Jan. 15, 2016	Xiaoping Wang of Zhejiang Univ. taught in Jimei Univ.	Xiamen	Zhejiang Univ., Jimei Univ.
Mar.31, 2016	Off-site and high-definition network interactive video conferencing at the same time	Hangzhou, Chongqing, Chengdu, Xi'an, Qingdao	Zhejiang Univ., Chongqing Univ., Sichuan Univ., Xi'an Univ. of Technology, Ocean Univ. of China, China Jiliang Univ., Zhejiang Univ. City College
Dec 14, 2016	interactive video conferencing	Hangzhou, Wuhan, Xiamen, Nanchang, Qingdao, Chengdu	Zhejiang Univ., Huazhong Univ. of Sci-Tech, Jimei Univ., Nanchang Hangkong Univ., Ocean Univ. of China, Sichuan Univ.

3.5 Achieved stage results

Based on the work around CNOESPOC O2O teaching reform, the following stage results has been achieved.

- Two Zhejiang University teaching achievement awards in 2016, among which, "the students-oriented and four means integrated reform and practice of the Principle of Microprocessor and Interface Technology (PMIT)" won the first prize, the other "O2O teaching of Applied Optics (AO) based on the concept of interactive sharing" won the second prize.
- Two published papers[1, 2].
- Four CNOESPOC O2O teaching implementation guidelines. Among which, one is for AO provider, the other is for AO receiver, the else are for PMIT provider and receiver respectively.
- More than ten CNOESPOC O2O teaching pilot reports.

4. CONCLUSIONS

By adopting CNOESPOC O2O teaching mode, the on-line resources quality is ensured and the academic advantages of the resource provider can be fully explored, the receivers can easily select what resources they need and make them be localized for off-line teaching and discussion. Students can learn at anytime and anywhere with massive on-line resources and effective on-line Q&A. The sharing of teaching resources between different schools blurs the boundaries between the resource provider and receivers, and at the same time achieves a mutual cooperation. It embodies the mobile learning, mixed learning and collaborative learning. The interactions between students and teachers can be strengthened in the learning process. The multi-round off-site national optical education teaching resource sharing practice had accumulated rich first-hand information and useful experience. It benefits nearly 4 thousand students from different colleges and universities which are distributed in nearly 20 provinces and regions of China. We think it is a good technique that can profit the top teaching resources in China to the general student all over China. CNOESPOC O2O teaching mode under the background of the ‘Internet +’ has exemplary values and is easy to generalize and apply to different universities and other disciplines.

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