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Abstract

Purpose – The purpose of this paper is to discuss a teaching project and a series of systematic efforts to promote an information literacy instruction (ILI) module and transform it into a successful and well-established massive open online courses (MOOCs). Specifically, this paper provides not only a detailed description and discussion on these transformation processes, but also a comparative analysis of two very different teaching approaches.

Design/methodology/approach – This paper focuses on the ILI module in Wuhan University with a top-ranked Library and Information School in China. As a result, this module has been treated as a case study to investigate the transformation processes from a traditional module to MOOCs. Specifically, two research processes are scrutinized in this study, namely, analytic hierarchy process analysis and data analysis on the ILI MOOCs.

Findings – It has become evident that ILI is widely considered to be extremely important, not only for university students, but also for a large number of post-college professionals in various industries. Moreover, by using innovation and interactive online techniques, MOOCs have significantly improved the quality of ILI.

Practical implications – If a module is delivered to a large number of students, MOOCs are effective and convenient. To ensure a successful ILI course, this study describes a detailed procedure for transforming a traditional course to a ubiquitous, high-quality and interactive one.

Originality/value – This paper represents early attempts to develop MOOCs on ILI in China. In addition, experience and insight from this study are of interest to university educators and policy makers with implications beyond the Chinese educational system.

Keywords Information retrieval, Higher education, Education technology, Information literacy instruction, Library science education, Massive open online course

Paper type Case study

1. Introduction

Information literacy (IL) is an essential set of skills (Association of College and Research Libraries, 2000), with which information seekers can "recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information" (American Library Association, 1998). Chartered Institute of Library and Information Professionals (2012) further noted that IL skills enable us to understand when and why information is needed, how to access and evaluate the information resources available as well as how to use and communicate the information in an ethical manner.

In today's information society, with the explosion of information and information resources as well as the ubiquitous application of information technologies, IL is considered the basis for life-long learning (Brown *et al.*, 2003), common to all disciplines,

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all learning environments and all levels of education (Farkas, 2012). Some researchers go even further, asserting that one cannot achieve educational and professional targets without possessing and appropriately utilizing IL skills (Wakimoto, 2010; Gross and Latham, 2012).

With an increasing awareness of the value and importance of IL, information literacy instruction (ILI) has been widely included in undergraduate and postgraduate curricula in almost all universities around the world. There are a number of successful and well-established ILI courses at universities in North America and Europe. For example, University of Washington provides a course-embedded ILI including course materials guidance and assignment collaboration. University of North Carolina at Chapel Hill has a course which introduces the tools for IL. The Library of University of Twente opened an IL course of seven modules for different levels of students. IL course are usually offered by the University Library or School of Library and Information Science (LIS). In 2000, the Standard Committee at the Association of College and Research Libraries approved and published "Information literacy competency standards for higher education." These standards were soon widely adopted as the basis for designing and developing ILI courses.

Recently, massive open online courses (MOOCs) has been considered as a more convenient and effective approach (Viehland, 2014) for delivering an ILI course. MOOCs refer to online courses aimed at unlimited participation and open access to courses via the internet (Ebben and Murphy, 2014). Additionally, MOOCs are effective, as they not only offer opportunities for virtual, ubiquitous, mobile and equal learning, they also effectively eliminate the limitations of time, space and location in traditional teaching (Sharples *et al.*, 2015). Since 2012, MOOCs have been generally accepted by universities around the world to deliver information not only to their students, but also to anyone who desires to learn and to acquire new information, knowledge and skills (Pappano, 2012). Veletsianos and Shepherdson (2016) reported a systematic analysis of MOOCs literature published in 2013-2015 which represents the geographic distribution, publications, citations, research methods and research strands of the literature.

The emergence and development of MOOCs have also attracted the attention of Chinese scholars, educators and politicians (Cai and Wang, 2013). In China, MOOCs have been regarded as useful means for providing universal, equal and life-long learning to the population of 1.3 billion (Zhang *et al.*, 2015). While the *New York Times* regarded 2012 as "the Year of the MOOCs" (Pappano, 2012), Chinese scholars and researchers proclaimed 2013 as "the Year of the Chinese MOOCs" (Cai and Wang, 2013). The MOOCs movement in China began in 2012. The Ministry of Education (MoE) and the Ministry of Finance of the Chinese Government jointly launched an iCourse program (iCourse is a registered trademark, it also named iCourses and introductions are available at www.icourses.cn/en/), which aims to encourage and fund the conversion of a number of popular and well-received university courses into MOOCs as well as to provide universal access to university education. Through April 2016, more than 680 MOOCs have become available on the iCourse website, which has more than a million of active online users. There are MOOCs courses for all the students, as well as the small private online course (SPOC) targeting a special population.

These initial steps and efforts to establish Chinese MOOCs are successful. However, the development of iCourse in China lags behind that of the colleges in the West, such as Coursera. Coursera is a very popular MOOCs platform in North America and Europe. Currently, it has over 1,000 courses available and more than 12 million users. Besides, edX and Udacity also are the most famous MOOCs platform in the world, they

are named the "the three carriages of MOOCs" (Yuan, 2013). In fact, MOOCs are developing rapidly in developed countries, for example, iversity is a German MOOCs platform, Future Learn is a distinguished MOOCs platform in UK, open2study is a popular MOOCs platform in Australia and MiriadaX in Spain as well as Fun in France are welcomed. Also, comprehensive multinational MOOCs platforms are very important like Khan Academy, Canvas Network, OpenupEd, Udemy, Academic Earth and so on.

Many researchers point out that some current problems in Chinese MOOCs development are due to the absence of clear guidance as well as standard and quality assurance in the development of each course (Cheng *et al.*, 2014). Usually, the development process of each course is based solely on the instructor's own perception and experience. Thus, it became obvious that it was imperative to establish a guideline for MOOCs development in Chinese universities.

Compared with ILI for college students and researchers, ILI courses for public are lacking. However, in the new era of internet, IL has become a necessary living skill for every citizen and the ILI for the public is in great demand. Therefore, this project is designed to set up MOOCs aimed to benefit the public. The course has been available on the iCourse platform since September 1, 2014. More than 200 teachers from all over the country voluntarily contribute to the course development.

2. Related definitions and works

2.1 MOOCs definitions and concepts

MOOCs represent the latest innovation in the development of open online education and the free sharing of educational resources. According to McAuley *et al.* (2010), "MOOCs are online courses with the option of free and open registration, and with a publicly shared curriculum and open-ended outcomes." MOOCs integrate social networking methods and techniques, provide publically accessible online resources and are led by scholars and practitioners in the research field (Gasevic *et al.*, 2014).

Moreover, MOOCs re-define traditional teaching methods, effects and relationships between students and course instructors. In fact, MOOCs transform traditional teacher-centered education into virtual, ubiquitous and truly student-focussed education (Kizilcec *et al.*, 2013). McAuley *et al.* (2010) assert that the development of MOOCs focus on the engagement of learners, who are able to organize themselves based on their learning goals, prior knowledge, skills and individual interests. Therefore, it has been claimed that MOOCs represent a revolutionary change in traditional education (Mazoue, 2014).

There are two fundamental characteristics of MOOCs: massiveness and openness. Massiveness represents the provision of an equal and flexible environment for a very large number of students who can participate in various stages of the learning process simultaneously. Furthermore, MOOCs can effectively form a fairly large online learning community, which facilitates and encourages communication and knowledge sharing among the students (McAuley *et al.*, 2010).

Openness represents another core characteristic of MOOCs. Jacoby (2014) describes openness as open communication and open online participation in an open networked environment. Koutropoulos *et al.* (2012) add that the concept of openness in MOOCs should include open courses, open content and open access to educational resources. Furthermore, Rodriguez (2013) adds that openness also means access to open-source software, open registration for anyone who has an internet connection, open and customizable curricula, open assessment processes and openness to a range of different learning environments.

Despite numerous advantages and benefits common to any new approach to education, Ebben and Murphy (2014) suggest that "completion rates in MOOCs are less than 10%", which is a very low number. And, Hew and Cheung (2014) identify a series of reasons why the completion rates are low in MOOCs such as "a lack of incentive, insufficient prior knowledge, a lack of focus on the discussion forum, failure to understand the content and so on." So we should admit that MOOCs are free to learn, however, free takes some problems and researchers try to solve it to make MOOCs better.

Therefore, MOOCs-based learning environment is probably not suitable for all subjects and courses. In fact, each course should be carefully considered before transforming into MOOCs.

2.2 ILI in Chinese universities

ILI is considered essential to all university students in China (Li and Wang, 2009). IL fosters students' abilities to retrieve, access and use information. In fact, the development of ILI was initiated by the Chinese MoE, which established four guidelines in 1984, 1985, 1992 and 1998, as listed in Table I.

In Chinese colleges and universities, IL has been a compulsory course for LIS majors and an elective course for social science and natural science majors. IL includes methods and techniques of information retrieval. More specifically, students are taught how to use information devices including PC, the internet, smartphone; they also use other tools such as library catalogs, digital platforms, databases, search engines, to obtain information.

However, the majority of IL educators still use traditional face to face (F2F) teaching method. With the popularization of PCs, more teachers are likely to use computers to teach ILI (Kong, 2014).

2.3 Development of MOOCs on ILI

Since the emergence of MOOCs, researchers and practitioners realized that the collaborative online environment and interactive teaching methods of MOOCs have challenged the traditional ways delivery of IL courses are taught (Mackey and Jacobson, 2010). As one of the primary MOOCs of IL, Metaliteracy, is composed of librarians, IL educators and senior faculty members from State University of New York. It explored a novel way to deliver ILI by MOOCs approach which fuses communication, collaboration, investigation, inquiry, etc. The directors of Metaliteracy

Time	Name of documents	Contents
1984	The opinions about open literature retrieval and utilization the course	Teaching fundamental knowledge of literature retrieval; introduction of tools and content of literature retrieval; methods for document management
1985	The opinions about improvement and development of literature retrieval course	Suggestion to establish this course as a compulsory course; libraries should cooperate with instructors to improve this course
1992	The fundamental requirements for teaching literature retrieval course	Use of auxiliary teaching technology; organize teachers' training; host awards for this course
1998	Specialty catalog and introduction of undergraduate course to colleges and universities	Use of information and network technologies for retrieving, managing and storing of literature and information

Table I.
Guidelines for ILI in China

then released it on Coursera in February 2015, the largest MOOCs platform in the world. Metaliteracy has achieved an initial success that encourage us to make our LIL MOOCs.

Our course is named Information Retrieval which takes the public as the major audiences in a practical and concise way. The objective is to improve the life quality, learning ability and productivity of the public and enhance their problem-solving capabilities through ILI. The course consists of a variety of teaching resources especially through rich media. A large number of domestic and foreign movie clippings, snippets of TV programs and audio and video materials related to the course have been included. Flexible and diverse teaching forms have been applied in the teaching process. There are the instructions of theory, method and tool, as well as the case analysis, information retrieval games and the analysis of movies or TV program clips.

On the demand of the MoE since 1984, IL was introduced as a core required course for all students in almost all Chinese universities. For more than 30 years of ILI in teaching has been considered "not easy" (Huang *et al.*, 2015). Teaching IL course often requires involvement, collaboration and negotiation between LIS faculties and university librarians. Furthermore, with the dramatic increase of student enrollment in Chinese universities in the last decade, teaching IL has become an extremely heavy workload for lecturers; enrollments can reach nearly 8,000 students per year in IL in one university.

Moreover, from the perspective of students, the quality of instruction is not highly rated because of the traditional classroom-based teaching approach. It has been reported that students have commented that ILI in their universities was "boring," "not practical," and "not personalized" (Huang *et al.*, 2015). Therefore, it is possible that the quality of ILI can be significantly improved if the course can be delivered as MOOCs.

3. Research design and methodology

3.1 Research aim and objectives

As a new style of ILI, MOOCs have attracted lots of learners. However, what is the real effect of MOOCs especially when compare with the F2F approach and traditional online course of ILI is the key question in this study. This paper aims to analyze the characteristics of our course with students' feedbacks. In particular, we will try to answer following three questions:

RQ1. What are students' expectations of the ILI MOOCs?

RQ2. What are the advantages and disadvantages of the ILI MOOCs in comparison with the F2F ILI courses and traditional online ILI courses?

RQ3. What are the success factors and relative limitations of our course?

3.2 Case selection

This paper is focussed on the MOOCs Course of Information Retrieval. The course was chosen as a case for the following reasons:

Our course is offered in the School of Information Management, Wuhan University (SIM of WHU). SIM of WHU has been consistently ranked the first in the field of Library and Information Science since 1995 in China. Wuhan University is a member of "985 Project" ("985" stands for a time which means Chinese Government start to build some universities to be world-class from May 1998) and "211 Project" ("211" means Chinese Government decide to fund 100 key universities for the twenty-first century) in

China which stand for the highest-level universities in China as The Ivy League in USA or Russell Group in UK. SIM of WHU joined iSchool (the iSchool organization is an alliance of world's top information schools) in 2009 and is the first member from developing countries. This ILI course has received several prestigious awards before it is transformed into MOOCs. In 2010 and 2013, the course was identified twice as the National Excellent Course and National Excellent Resource Sharing Course by MoE.

This course reflects the evolvement of ILI in China. It originated from the bibliographic instruction program provided by the Boone Library School, which was founded in 1920 as the earliest educational institution in Library Science in China.

The course was devoted to finding printed sources till 1984. In 1984, 1985 and 1992, MoE issued guidelines to urge all universities and colleges to offer courses for document retrieval. From then on, ILI courses have been uniformed in name and content and computerized searching was later added. From the 1990s, with the name change of School of Library and Information Science to School of Information Management, the name of the ILI course was changed from document retrieval to information retrieval. Since 2000, the course became available online at Blackboard (one of the biggest online learning platform) in 2007, and then in 2010 it was offered as a life-long learning platform for the public. Today, this course has been transformed into MOOCs and it is available to everyone.

Our course has been a great success. It has been taught online for four semesters till now and more than 15 thousands of students took the course each semester (with a total of over 60 thousands). Overall, more than 95 percent of the students praised the course. This course has been recommended as a compulsory or selective course for the undergraduates in some key universities such as Central China University of Economics and Law, Hunan University and Soochow University. The course is required for librarians' continuing education by Guangdong Society for Library Science. The course is highly rated by the Library Society of China, Shanghai Society for Library Science, Guangxi Society for Library Science, as well as by some well-known experts in the field of Library and Information Science.

The course designer was invited to share her experience on MOOCs with all the deans and department heads of who are members of the National Steering Committee for Education and Teaching in Library Science, this giving impetus to many universities to start the MOOCs construction. It is worth noting that the course was introduced as a best practice of Information for All Program of UNESCO at the 70th anniversary of UNESCO in November 2015.

3.3 Research method

Two research methods were employed in this study.

3.3.1 Analytic hierarchy process (AHP) method. AHP: in the AHP process, there are three phases: background analysis, comparison and factors analysis which correspond to *RQ1*, *RQ2* and *RQ3* respectively. In the background analysis, we investigated the students' background in terms of age, district, the profession, major and education level. Then, in the comparison process, we compared ILI MOOCs with F2F ILI course and traditional online ILI course respectively to explore the students' real experiences in learning ILI by different approaches. At last, factors analysis was used to examine the feedback. We designed a ten-point method to confirm the favorable factors of our course as well as adverse factors. AHP clearly highlights the key aspects of ILI MOOCs including students, MOOCs' contents, ILI courses in other approaches and so on (Figure 1).

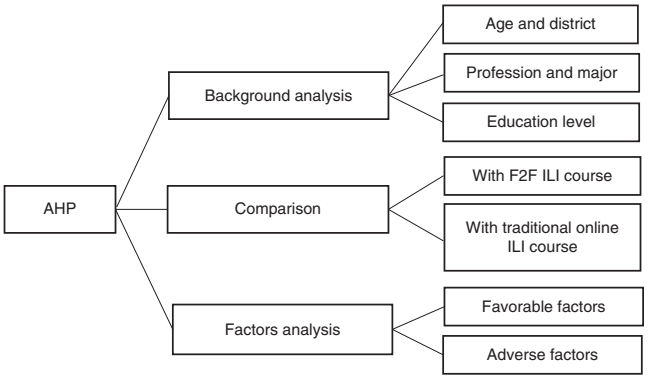

Figure 1.
The AHP process in this study

3.3.2 Questionnaire method and data analysis. We conducted a survey by sending out a structured questionnaire through the internet and social networks in November 2014. All survey participants were the students of our course. After an initial background screening, we selected 1,000 students to participate in this survey and finally received 775 (77.5 percent) valid responses. The questionnaire was made available on one of the most commonly used Chinese academic questionnaire service website, Sojump (www.sojump.com). To ensure the validity of the data, we use crosstab analysis for background analysis. In comparison process, we used not only compare analysis, but also Likert-type scale method. Survey data were transformed into SPSS to form a statistical analysis. At last, in factors analysis, we design a ten-point system to probe students' feedback on MOOCs to determine the success factors and adverse factors.

4. Results

4.1 Backgrounds analysis

4.1.1 Student characteristics. According to the questionnaire, we found that among all respondents, 43.74 percent were male and 56.26 percent were female. As for age, 0.26 percent were below 16 years old, 2.58 percent were above 50 years old. The percentage of students who were between 17 and 22 years old was the largest (33.55 percent), while the number of students who were between 23 and 29 years old was 24.52 percent. In all, 24.26 percent of the respondents were between 30 and 39 years old, 14.84 percent of the respondents were between 40 and 49 years old.

In order to answer *RQ1*, we selected five layers, they are districts, ages, professions, education levels and majors to distinguish the respondents' characteristics as shown in Table II.

In terms of the districts, we found that the students came from different provinces across the country. However, different districts gave different fractions of the students. For instance, most respondents were from Guangdong Province, followed by those from Hubei Province, then Jiangsu Province, Beijing, Zhejiang Province, Henan Province respectively, probably because these provinces are the relatively more developed areas in China. Another reason for this distribution could be that Wuhan University is in Hubei Province and, of course, local students would support their own MOOCs. Additionally, we investigated the education levels of students. The data illustrates that 68.13 percent of the participants hold a bachelor's degree or were

Factors	Instances	Findings
Districts	Province or the capital as unit, such as Beijing, Henan, Guangdong, etc.	Most students are from the developed districts in China like Guangdong Province and Beijing
Ages	0-16, 17-22, 23-29, 30-39, 40-49, over 50 years	Most students are young people between 17 and 29 years old
Professions	Full-time students, young teachers, librarians, SMES employees, etc.	Most students are full-time workers and librarians
Education levels	High school, undergraduate, graduate, PhD candidate, etc.	Most students are undergraduate and postgraduate
Majors	Management, science, art, engineering, etc.	Most students are majoring in management and engineering

Table II. Layers of factors by respondents' backgrounds

pursuing one, while 26.58 percent of the participants hold a master's degree or were pursuing it. These two levels of students comprised the majority of respondents.

As for the majors, as shown in Figure 2, we found that students who were pursuing a degree in management constituted almost 35.48 percent, followed by engineering (18.06 percent) and then other humanities and social science majors (15.61 percent). It was obvious that IL was more beneficial for the students of the above mentioned subjects. In comparison, science, medical, agronomy and art students did not benefit as much from this course, given that the number of students who major in these subjects are fewer in China.

Figure 3 shows that there are 326 full-time students and 275 librarians among 755 respondents who comprise 79.6 percent of the total number. It is a fact that in China, not all librarians have excellent IL, especially in the more complicated information environments. Nevertheless, librarians are willing to accept more professional training via the internet. Young teachers, who occupy the third position by number at 50, would

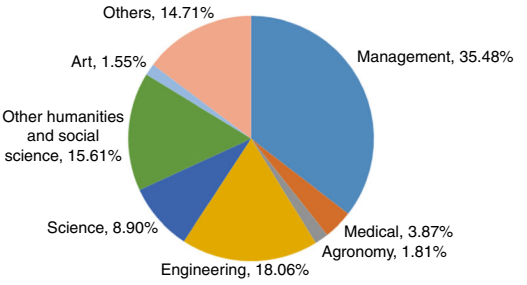

Figure 2. Percentage of students' majors

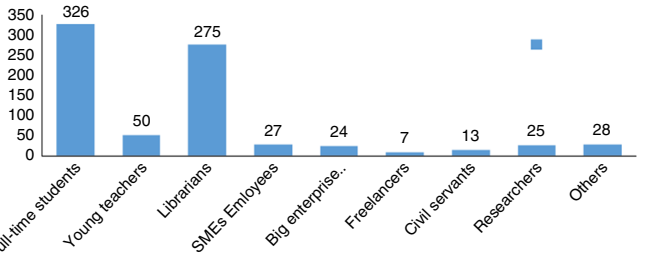

Figure 3. Numbers of students from different professions

like to improve their ability to acquire useful information. Small and medium-sized enterprise employees, large enterprise employees, freelancers, civil servants, researchers and others constitute small fractions among all students.

4.1.2 Students' expectations. Different participants hold different expectations of our course. In fact, the survey shows 21.29 percent of the respondents had never participated in any course discussion, 6.58 percent of the respondents asked questions during the course but never received answers, and 31.23 percent of the respondents asked questions and received answers. 25.81 percent of the respondents always took part in discussions and 15.10 percent of the respondents always heard the discussions but never participated in them.

Table III illustrates the facts that students have different expectations due to their levels of education. Based on our cross analysis, we found that "To enrich knowledge" and "To learn skills of information retrieval" were the two most important expectations of the students, while undergraduates and graduates maintained that "To meet the demand of major learning" was the third expectation which was different from other students who had different education background. Meanwhile, 28 percent of the students who were PhD candidates or had a PhD degree selected "To solve information problems" as their third option.

Table IV shows that professional students who had the same expectations, namely, "To learn skills of information retrieval" and "To enrich knowledge," while young teachers and researchers put "To solve information problems" on the third position, which was different from other professions.

4.2 Comparison

In this process, we used a set of five-point questions along with the Likert-type scale to confirm students' opinions on the comparisons that ILI MOOCs with F2F ILI course and traditional online ILI course. In the five-point system, 1 means totally disagree, 2 means disagree, 3 means almost, 4 means agree and 5 means totally agree. Beforehand we designed two contrastive questions according to the features of F2F course and traditional online course. Then, the results were exported from Sojump to SPSS as SAV format and reliability analysis and factor analysis have been conducted in SPSS (version. 20.0).

Table V shows that in comparison to the F2F teaching method, our course had eight main advantages, including close to real life, fruitful teaching style, flexible timing, more casual learning environments, more knowledge, closer contact with lecturers, more convenient communication and more independent learning. The data shows that the majority of the students agree (totally average $= 4.18$). Some students disagree

Table III.
Demand analysis by educational degree

Degree/ Demands	Enrich knowledge (%)	Learn IR skills (%)	Good content (%)	Solve information problems (%)	Acquire certification (%)	Major demands (%)	Other reasons (%)
Junior high school	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100)
High school	11 (73.3)	14 (93.3)	0 (0.0)	0 (0.0)	1 (6.7)	1 (6.7)	1 (6.7)
Undergraduate	319 (60.4)	379 (71.8)	27 (5.1)	78 (14.9)	32 (6.1)	135 (25.6)	8 (1.5)
Graduate	106 (51.5)	137 (66.5)	14 (6.8)	42 (20.4)	10 (4.9)	57 (27.7)	6 (2.9)
PhD candidates	13 (52.0)	17 (68.0)	2 (8.0)	7 (28.0)	3 (12.0)	4 (16.0)	0 (0.0)

Professionals/ Demands	Enrich knowledge (%)	Learn IR skills (%)	Good content (%)	Solve information problems (%)	Acquire certification (%)	Major demands (%)	Other reasons (%)
Full-time students	202 (62.0)	257 (78.8)	22 (6.8)	52 (16.0)	13 (4)	38 (11.7)	4 (1.2)
Young teachers	25 (50.0)	36 (72.0)	2 (4.0)	19 (38.0)	3 (6.0)	8 (16.0)	0 (0.0)
Librarians	136 (49.5)	156 (56.7)	13 (4.7)	34 (12.4)	25 (9.1)	142 (51.6)	8 (2.9)
SMEs employees	20 (74.1)	23 (85.2)	2 (7.4)	4 (14.8)	0 (0.0)	2 (7.4)	1 (3.7)
Large enterprise employees	18 (75.0)	22 (91.7)	0 (0.0)	4 (16.7)	0 (0.0)	0 (0.0)	1 (4.2)
Freelancers	5 (71.4)	6 (85.7)	0 (0.0)	0 (0.0)	0 (0.0)	2 (28.6)	0 (0.0)
Civil servants	8 (61.5)	10 (76.9)	0 (0.0)	1 (7.7)	1 (7.7)	1 (7.7)	0 (0.0)
Researchers	17 (68.0)	16 (64.0)	0 (0.0)	7 (28.0)	2 (8.0)	3 (12.0)	1 (4.0)
Others	18 (64.3)	21 (75.0)	4 (14.3)	6 (21.4)	2 (7.1)	1 (3.6)	1 (3.6)

Table IV. Demand analysis by professionals

Option/Preferences	Mean	*n*	SD	Sig. (two-tailed)
Learning places are more casual	4.57	775	0.588	0.000
Time is more flexible	4.56	775	0.587	0.000
Learning is more independent	4.51	775	0.649	0.000
Teaching style is more fruitful	4.27	775	0.696	0.000
Content close to life	4.16	775	0.736	0.000
Knowledge is more	4.11	775	0.864	0.000
Communication is more convenient	3.72	775	0.977	0.000
Closer with lecturers	3.55	775	1.022	0.000

Notes: Totally average = 4.18; Cronbach's $\alpha = 0.856$

Table V. Compare MOOCs with F2F of ILI

with some of the above, especially that our course allows closer contact with lecturers and more convenient communication than in the traditional courses. Moreover, we felt surprised that many students disagree that communication is more convenient in MOOCs than in F2F course. In order to answer this unexpected question, we would interview students to explore why that happened and discuss it in the following parts.

As Table VI shows, in the past university educators would design a traditional online course like MIT's computer science courses that have become famous all over the world. However, there are many weaknesses in these traditional online courses, such as poor video quality, lengthy course content, absence of a certification system and others. In comparison to a traditional online course, MOOCs are better according to the majority of the students surveyed. The data shows that most of students agree that in MOOCs content is newer, content is richer, media is better used and the exam system is better designed when compared with the traditional online course. However, many respondents disagree with the opinion that "feel closer with the lecturers."

4.3 Evaluation

In order to make a detailed score, we used a ten-point system to represent feedback on course quality. This survey has been tested by reliability in SPSS. As Table VII shows,

the highest point was for course design followed by teaching materials, practical degree, teaching skills and video quality. In contrast, the scores of complexity, teaching team and test design were relatively low. That means that the auxiliary teaching team still has the potential to step forward to provide better service. The results were as expected for our course. They can also be used to demonstrate advantages and disadvantages of MOOCs.

5. Discussion

5.1 Answers on RQ1, RQ2 and RQ3

For *RQ1*, we found the students of our course have diverse backgrounds in districts, ages and professions. It is well known that students always have the same background in F2F course and similar background in traditional online course. Obviously, MOOCs make everyone participate in ILI. Then, we examined different layers of requirements of ILI MOOCs. The results show that students with different backgrounds have different needs for ILI. We designed universal modules like information retrieval in health care and travel, and some major-specific modules such as how to use Web of Science, how to retrieval business data and evaluate the retrieval results to measure their needs. The large number of students from different backgrounds have confirmed our teaching strategy.

For *RQ2*, the data have proved most of the students agree that MOOCs have a range of advantages when compare with F2F course and traditional online course. However, we are still dissatisfied with some aspects of MOOCs, for example, the relationship

Table VI. Compare MOOCs with traditional online course of ILI

Option/preferences	Mean	*n*	SD	Sig. (two-tailed)
Content is newer	4.30	775	0.700	0.000
Knowledge is more	4.19	775	0.777	0.000
Media is better	4.18	775	0.750	0.000
Test and exam system is better	4.15	775	0.771	0.000
Certificate system is better	4.07	775	0.784	0.000
Class forums are better	4.05	775	0.825	0.000
Feel closer with lecturers	3.84	775	0.96	0.000

Notes: Totally average = 4.11; Cronbach's $\alpha = 0.899$

Table VII. Feedbacks on MOOCs

Options/marks	1	2	3	4	5	6	7	8	9	10	Average
Course design	1	0	1	0	17	19	43	123	226	345	9
Practical degree	1	0	1	3	16	21	57	105	213	358	8.98
Teaching materials	1	1	1	5	19	22	47	140	196	343	8.9
Teaching skills	1	0	1	2	24	27	49	141	215	315	8.84
Video quality	1	1	2	2	21	25	46	160	202	315	8.83
Examination design	1	2	2	1	31	25	53	146	231	283	8.73
Time arrangement	2	1	2	6	33	29	54	139	192	317	8.72
Complexity	1	0	6	6	34	28	59	133	200	308	8.69
Test design	1	2	1	3	28	28	58	162	230	262	8.67
Teaching team	0	0	3	2	38	27	57	161	189	289	8.58

Notes: $n = 775$; Mean = 8.79; $F = 15.132$; Cronbach's $\alpha = 0.926$; Sig = 0.000

between lecturers and students, and the communication mechanism. MOOCs are famous for their openness, flipped class and certification system, we have not yet built a perfect ILI course and we need to improve our course design continuously.

Where ever it goes, our course has achieved initial success as MOOCs. In our survey, the success factors are as followings: first of all, MOOCs transformed ILI from a course oriented for specific students to a course for everyone, an essential factor in the "Big Data" era. Second, our teaching strategy has successfully attracted thousands of students to learn ILI MOOCs. Third, we have a strong teaching team which consists of famous professors in Library Science, librarians with rich skills of information retrieval, graduate teaching assistants who are good at communicating with students, etc. Multimedia have been used in our course to present it more lively and attractive. For example, the teaching team selected many information retrieval trailers from famous movies like Spiderman, and some useful files were uploaded to the forum, like the WHO model list of essential medicines, to become part of an open education resource system.

5.2 Unexpected matters and interviewing

Some unexpected matters occurred during this study. The first surprise is that students gave a low point on such options as "communication is convenient" and "feel closer with lecturers." We originally envisioned these two options could achieve high marks, however, the results is on the contrary. Through interviews with students, we found that students prefer to communicate with lecturers directly by social networks and face to face. In fact, the lecturers of our course only organized some simple online activities. Many students learned MOOCs on the teachers' reputation, the teaching team could not meet their needs for Q&A in learning.

The second unexpected result is the reaction to the opinion that the system of test, examination and certificate in MOOCs did not achieve a high mark. MOOCs' test and certificate systems are welcomed and have been proved it could help students have perseverance in learning MOOCs. But, our course could not prove that. After interviewing with respondents, the answers are students feel the complexity of test and exam is not very stabilization. For example, the tests in the general modules were very easy but the tests in major-specific modules were relatively hard. For the exam, some students considered it was very easy but some others thought it was too hard. This suggests that our modularized teaching is successful, but, the tests are not modular, they maybe not suitable for massive students who have different backgrounds. So, it is important to make the test, exam and certificate system more reasonable.

The last unexpected factor is that the teaching team received the lowest point. As previously mentioned, director of our course specially organized a strong teaching team, however, it is obvious that they did not deliver the desired effect. We also learned about that students thought that the teaching team was good, but, the team members could not answer all the questions, could not be online all the time and could not offer more learning materials. That means the team has much to do to improve their teaching.

6. Conclusion

This study offers several insights for librarians and instructors those who teach IL courses, or plan to transform traditional courses into MOOCs.

A certificate system should be set up to attract more students. The majority of the participants prefer MOOCs to traditional online courses, but they give one of the lowest

scores in "certificate system" (Table VI). Faced by the job seeking pressure and limited time, students have strong desire for course credits or certificate for taking MOOCs. It is a good start that MoE issued a document in May 2015 to encourage Chinese universities and colleges to award credits or certificates to students for taking MOOCs.

A student-centered syllabus must be created and updated. The survey results show that the course of the study got the higher score in this aspect (9 from 10 points). With the development of technologies and search tools, search behaviors and information needs of the students may change constantly. A recent report by China Network Information Center shows that many users acquire information through mobile search. Thus, methods for mobile search, mobile search functions of major search engines or databases should be added to the teaching content. On the other hand, those teaching parts concerning tools or functions out of services should be cut.

SPOC for librarians should be developed as soon as possible. Required by MoE, ILI has been taught mainly by librarians in almost every university and college since 1984, but this is their extra task. Our survey has proved that the total quality of ILI courses is quite poor. It means that IL of the teachers must be improved. In fact, 27 percent of the students of this study have justified their needs. SPOC for librarians helps to improve their IL and that of the students.

Faculty members from LIS schools and librarians must communicate and collaborate closely to satisfy the needs of massive students. Both parties have different needs and focus, but they have the same goal, that is to say, to improve IL. IL is a critical twenty-first century skill for success. It can be predicted that more and more students need ILI MOOCs. The ever increasing number of IL students will post a great challenge for both LIS faculty members and librarians. This study calls for closer cooperation among all players of IL nationally and internationally.

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