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A Study on Online Learning Behaviors of the Private University Students Based on SPOC Mode—Take Zhejiang Yuexiu University as an Example

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Abstract

With the rapid development of MOOCs and SPOC in higher education under the wave of education informatization, research on online learners' behavior has received more and more attention from university researchers. However, there are just a few studies on online learning behaviors of students in private universities. Relying on Zhejiang Province's first-class undergraduate course (online and offline hybrid)—A Survey of Major English-speaking Countries, this paper conducted a study on the analysis of students' online learning behavior based on SPOC mode, by collecting data on the online learning behavior process of 224 junior students from Zhejiang Yuexiu College of Foreign Languages, including students' weekly login times to the platform, video viewing hours, total online learning hours, unit quiz scores, forum posting and final test scores. These data were statistically and analytically analyzed using SPSS.20, and correlation analysis was conducted using the Pierce correlation coefficient. The results show that students' participation in online learning is satisfactory, the teacher's ability to guide learning directly affects students' online learning logins, and students' learning performance is positively correlated with the number of course logins, video viewing hours, unit test scores and the number of forum posts, especially with unit test scores, but there is little student-student interaction in forum discussions. It can be seen that SPOC mode can organically combine traditional classroom with online classroom, especially visualize the characteristics of students' online learning behavior, help teaching administrators and teachers in private colleges and universities accurately grasp the learning status of learners, thus promoting them to provide strong support in the process of course reform, strengthen the ability and responsibility of information technology, integrate online and

offline teaching more efficiently, and at the same time make students to pay more attention to the usual grades, to focus on the cultivation of learning ability, thus giving students a complete and in-depth learning experience, improving the completion rate of the course and promoting the improvement of teaching quality.

Keywords

SPOC Mode, Private University Students, Online Learning Behaviors

1. Introduction

Since its inception in 2008, the MOOCs (Massive Open Online Courses) have quickly become a trendsetter in higher education. However, the explosive growth of MOOCs platforms, online courses and student enrolment has also led to a quality crisis (Xiao & Jiang, 2009). In this context, many of the world's leading universities such as Harvard University and the University of California, Berkeley, are experimenting with a more sophisticated type of course-the SPOC. SPOC (Small Private Online Course) was first introduced and used by Professor Armando Fox at UC Berkeley, Small and Private being the opposite of Massive and Open in MOOCs: Small means the number of students is limited to a few dozen to a few hundred, and Private means that there are restricted access conditions for students, and only those who meet the requirements are included in SPOC (Zhu & Liu, 2014). The small scale of SPOC mode can effectively provide teaching resources for university students, formulate more reasonable teaching contents and teaching evaluation rules, and its class format mostly adopts a mixture of face-to-face classroom and online self-learning, which is conducive to teachers' efficient management of the classroom and personalized teaching to meet learners' individual learning needs. Therefore, SPOC is a blended teaching mode that transforms the MOOCs mode into the universities (Wei, 2012; Zhu & Liu, 2014).

In October 2018, the Chinese Ministry of Education's "Opinions on Accelerating the Construction of High-level Undergraduate Education to Comprehensively Improve the Cultivation of Talents" clearly pointed out that it is important to promote the learning revolution through teaching reform, actively promote small-class teaching and blended teaching, build a teaching model that combines online and offline teaching, scientifically design course assessment content and methods, and continuously improve the quality of course teaching (Ministry of Education of People's Republic of China, 2018). In October 2019, the "Implementation Opinions of the Chinese Ministry of Education on the Construction of First-class Undergraduate Curriculum" proposed that "education and teaching reform must be deepened and the results of teaching reform must be implemented into the construction of the curriculum" and that "teaching methods reflect advanced and interactive nature, vigorously promote the deep integration

of modern information technology and teaching, and actively guide students to conduct inquiry-based and individualized learning". It is also pointed out that "online and offline hybrid first-class courses mainly refer to the use of appropriate digital teaching tools based on MOOCs, SPOC or other online courses, combined with the actual university course transformation, the implementation of 20% to 50% of the teaching time of the students online independent learning and offline face-to-face teaching organic combination of flipped classroom, hybrid teaching, to create online courses and our classroom teaching integration of the hybrid 'golden class' (Ministry of Education of People's Republic of China, 2019)." In this context, the first batch of online and offline hybrid course reform practices began in 2020 at the university where the author works. The course the author teaches, A Survey of Major English-speaking Countries (ASMEC for short), is an optional course for non-English majors in their third and fourth years. Due to the complexity of the knowledge covered in the course and a relatively weak foundation of non-English majors, 32 course hours are too limited. And the assessment of students' performance is not comprehensive and consists of only two grades, one for regular work and the other for final grades, which does not accurately reflect the learning process of students. These have seriously demotivated teachers and students, making course reform urgent. Therefore, with the help of this east wind of course reform from national to local institutions, the author tried to reform the course ASMEC based on the SPOC mode, collected a large amount of real-time data of students' online learning, and used the method of analysis and statistics to focus on the relationship between online learning behavior and learning effect of private university students, aiming to provide some ideas for the course reform of private universities, and at the same time provide some reference for the implementation of SPOC mode in private universities.

2. Literature Review

Generally speaking, online learning refers to the activities of learning and teaching via the Internet. In this paper, online learning refers to learning that occurs on an online teaching platform, and is narrower in scope than online learning in the general sense (and its close analogs, e-learning, networked learning, and digital learning). The online learning behavior that this study focuses on is mainly based on the various behavioral records left by learners on the teaching platform and the basic information of learners (Wei, 2012). By summarizing and analyzing the literature related to online learning behavior, the author found that foreign studies are mainly focusing on such factors which may affect the learning outcome as learners' motivation, interests, abilities to communicate, forum interaction with teachers in the MOOCs environment, with the following representatives. A log analysis by Ziebarth et al. showed an upward trend in the number of videos viewed by students during the exam period, suggesting that obtaining better exam scores may be one of the goals of students engaging in

learning in the SPOC platform (Ziebarth & Huppe, 2014). A team of pedagogical discourse analysts led by Professor Rose at Carnegie Mellon University found that higher-order cognitive behaviors and group positive/negative affect ratios of learners in MOOCs forums were positively correlated with learning effectiveness (Wang, Wen, & Rose, 2016). Goshtasbpour et al. found that interactive discussions between teachers and learners had a positive impact by using manual coding analysis of forum conversations and question questionnaires (Goshtasbpour, Swinnerton, & Morris, 2019). Binali et al. discovered that the degree of similarity in learning interests and the ability to communicate with each other among learners in an informal learning environment were key to achieving high learning outcomes (Binali, Chen, & Potdar, 2009).

In domestic studies, the topics mainly favored the connotative characteristics of online learning behavior, online learning behavior modeling and performance prediction, and online learning behavior influencing factors in MOOCs environment, while the research on online learning behavior in SPOC mode has not attracted enough attention. The main representatives are as follows: Liu Zhi et al. conducted a study on the variability of student behavior sequences in SPOC environment, the relationship between students' emotional characteristics and learning effectiveness in forum interaction, and the relationship between students' interest topic modeling and learning effectiveness (Liu, Wang, Zheng, Liu, Sun, & Yang, 2017; Liu, Yang, Peng, Liu, Shu, & Zhang, 2018; Liu, Liu, Li, Chai, Kang, & Liu, 2019); Sun Xiaowei analyzed students' online learning behavior from the course Data Structure and found that there were significant differences in online learning behavior among students of different genders and majors in the SPOC platform (Sun, 2017); Liu Bing et al. analyzed the student learning data of SPOC course Modern Educational Technology Application and found that the online learning process is mainly human-computer communication, and the degree of participation in interpersonal interaction is not enough. The degree of participation in interaction is related to the learning evaluation orientation and most of the discussion and communication is mainly one-way questions or answers, lack of deep-level Communication (Liu & Li, 2019). Lin Chunjie et al. analyzed the data in the SPOC mode of the course Computer Networks and discovered that the total learning time (ruminant ratio) was significantly correlated with the learning performance (Lin & Huo, 2020).

The above studies have given us a clear understanding of students' online learning behavioral characteristics, but these students are all from domestic and international public universities and colleges, and the learning data are mainly derived from science and technology courses. So, what are the characteristics of the online learning behavior of university students studying language and cultural courses as optional courses in private institutions under the SPOC mode? What is the relationship between students' learning behaviors and their academic performance? What does this tell us about improving the existing dilemma of optional courses in private universities? These are the issues that this paper proposes to address.

3. Research Design

3.1. Subjects and Data Source

This study takes the online course ASMEC offered by the author's university (Zhejiang Yuexiu University, ZYU for short) as the research object. The course began to be built in 2017 and was established as a ZYU's high-quality online open course in the same year. In 2019, the course was designated as a first-class undergraduate course (online and offline hybrid) in Zhejiang Province, and has been built on ZYU's online course platform for more than two years, and the various course resources on the platform are complete and fully capable of meeting the operation of the SPOC mode. In this study, according to the academic calendar of the first batch of online and offline course reform in the author's university, the SPOC mode lasted for 16 weeks (March 9, 2020-June 22, 2020), and a total of 224 students (219 female students and 5 male students) from 4 classes of the first batch of Chinese International Education majors participating in the course reform in ZYU were selected as the research subjects, using online and offline hybrid teaching mode. Before the class, students completed the learning tasks on the SPOC platform. During the class, students were tested on the effectiveness of their learning (pre-test), question and answer sessions, discussions, presentation of students' learning outcomes and reviews, and after the class, students were required to complete a post-test, and finally, after the online course was completed, students were required to take a final exam and a questionnaire on their learning experience in this course.

3.2. Data Collection

The data recorded on ZYU's online course platform includes students' majors, names, student numbers, the number of times they have logged in to the platform, the number of minutes they have watched videos, the total number of minutes they have studied online, and the results of their unit tests. Among these factors, the number of times students logged in to the course, the number of minutes they watched videos, and the number of times they posted and replied directly reflect what kind of learning behavior occurred, and the content of students' posts and test scores can reflect students' learning attitudes and learning styles. Therefore, the data collected in this study consisted of two parts: the first part was information on the number of times students logged in to the course, the number of minutes they watched videos, their scores on pre-tests and post-tests, and forum discussions. The second part was the final exam results, which all students took at the same time. The objective of collecting these two parts of information was to examine the relationship between online learning behavior and learning outcomes.

3.3. Data Processing

First, the data were statistically processed using EXCEL and SPSS20.0, and then the online learning behaviors such as the number of course visits, video viewing,

tests results and forum discussions were statistically analyzed to understand the general situation of student' participation in the course; finally, the Pearson correlation coefficient was used to analyze the correlation between the above factors, so as to explore the relationship between students' online behaviors and learning effectiveness, and then identify the important factors affecting learning effectiveness.

3.4. Data Results and Analysis

3.4.1. Course Login

We obtained the following results by counting the number of visits to the course for the students in the study, as shown in Table 1. 224 students visited 28,857 times, with 8.05 visits per week per capita, which reflects the relatively high motivation of students to learn.

In order to further understand the students' course login situation, the author did the weekly access statistics, and the results are shown in Figure 1. As can be seen from Figure 1, the weekly accesses were unevenly distributed, with the highest number of accesses in week 15, probably due to the fact that students needed to take the final examination of this course near the end of the term, and many students who had not studied the course enough in the early stage went to the blitz phase, thus the accesses rose. Week 16 had the lowest number of visits, which is due to the fact that SPOC teaching in these four classes has finished. Week 7 also had a high number of visits. This is because students were more interested in the content taught in this module, which is consistent with the results of our questionnaire. In addition, we also found a pattern that there is a small peak in weekly visits every other week, respectively in odd weeks, because the content of face-to-face lectures is taught in units every fortnight, and odd weeks are the beginning of each unit, students usually do pre-course study, and the lecturer will also remind students to complete online learning tasks through platform notifications, WeChat groups or QQ groups. It is clear that the teacher's guidance and requirements for students will directly affect the number of visits to the course platform. Therefore, teachers should pay more attention to the platform during the peak periods of student learning, answer students' questions in a timely manner, and supervise students' learning for the low periods of learning.

3.4.2. Video-Viewing Time

The lecture videos are a core part of the online course. The course ASMEC is a language and culture course for junior and senior students of Chinese International Education in ZYU, which involves many knowledge points and is difficult for non-English majors. Moreover, the content of the face-to-face lectures requires students to complete the lecture videos before class; therefore, the viewing length of the videos is important because this data can objectively reflect the level of student engagement in learning. There are 68 videos in the course, totaling 504 minutes, and the average length of the videos is 7.4 minutes, requiring approximately 33.6 minutes of video viewing per week. The videos watched are shown in Table 2.

Table 1. Course login (frequency).

Data Samples	Total Visits	Weekly visits per capita	Maximum number	Minimum number
224	28,857	8.1	730	47

Table 2. Video-viewing (minute).

Data Samples	Total Video Length	Video-viewing Per Capita	Online Learning Per Capita	Maximum video-viewing	Minimum Video-viewing
224	504	510.9	723.7	992	386

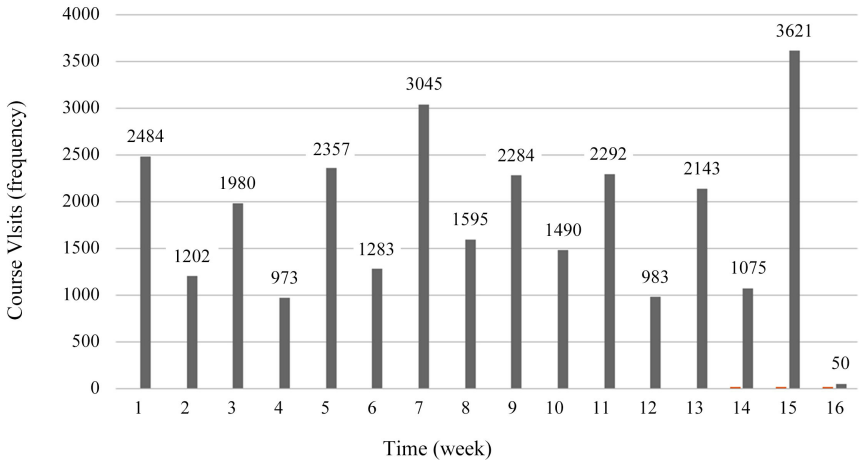

Figure 1. Weekly visits.

As can be seen from Table 2, the per capita length of video-viewing exceeded the total video length of the course by 6.9 minutes, indicating that the proportion of students repeating viewing the videos was low, and the per capita length of student online learning was 212.8 minutes higher than the per capita length of video-viewing, which accounted for 70.6% of the online learning per capita. The longest time spent on video-viewing was 992 minutes, with a completion rate of 196.2%, indicating that the student repeated the video several times, while the shortest time was 386 minutes, with a completion rate of 76.7%, showing that the student did not complete this task.

3.4.3. Unit Tests Results

The unit tests in the 5th session of the course ASMEC consist of pre-tests and post-tests. The pre-test is a test that is given before each unit of study to test the effectiveness of students' pre-viewing. It is released once every fortnight, seven times in total, and the test is limited to 10 minutes and scored out of 20. Students who have carefully pre-reading the textbook and watching the video will be able to score. The purpose of pre-test is to familiarize students with the module topics before the face-to-face lectures, and to help teachers adjust their teaching schedule and strategies later on. Figure 2 shows the mean score of students' 7 pre-tests: 170 students scored 17 - 20 (Group A) including 17, accounting for

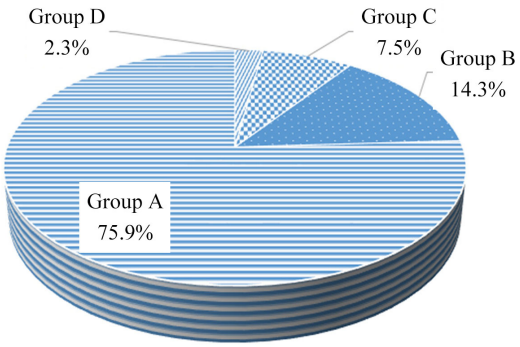

Figure 2. Pre-test scores pie.

75.9%; 32 students scored 15 - 17 (Group B) including 15, accounting for 14.3%; 17 students scored 12 - 15 (Group C) including 12, accounting for 7.5%; 5 students scored below 12 (Group D), accounting for 2.3%. It can be seen that the majority of students could get 12 points or more, which shows that the students' pre-study effectiveness is comparatively satisfactory.

The post-test is a quiz conducted after the completion of each unit of study, a total of 7 times, 30 minutes for every test, out of 100 points, all completed online. The content of the test is composed of 75% of the basic knowledge points and 25% of the difficult points, the basic knowledge from the text, videos and practice questions, the difficult points from the discussion part of the face-to-face class. **Figure 3** shows the mean score of students' 7 post-tests: 114 people (50.9%) scored 85 and above (Group A) including 85, 73 people (32.5%) scored 75 - 85 (Group B) including 75, 32 people (14.3%) scored 60 - 75 (Group C) including 60, and 5 people (2.3%) scored below 60 (Group D). The result shows that, compared to the pre-test, the percentage of students in group A in the post-test decreased by 20%, while the percentage of students in groups B and C increased by 18.5% and 6.8%, and there was no change in group D. The main reason for these changes is that the post-test is more difficult than the pre-test, in which the score loss rate of the difficult-related questions in the post-test is higher, which requires teachers to pay more attention to students' understanding and mastery of the important and difficult parts, and to be more targeted during face-to-face class. It was also found that in the pre-test, 98 out of 170 students in group A were still in group A in the post-test, 24 out of 32 students in group B were still in group B, 12 out of 17 students in group C were still in group C, and 5 students in group D did not change, which showed that the students in each group were relatively stable.

3.4.4. Forum Discussion

Students' discussions in the forum are the main manifestation of student-teacher and student-student interaction, and are therefore an important indicator for the evaluation of students' online learning behavior; discussions mainly consist of posting and replying to posts. Some researchers have also analyzed and studied this aspect, and the results show that there is a correlation between forum posting

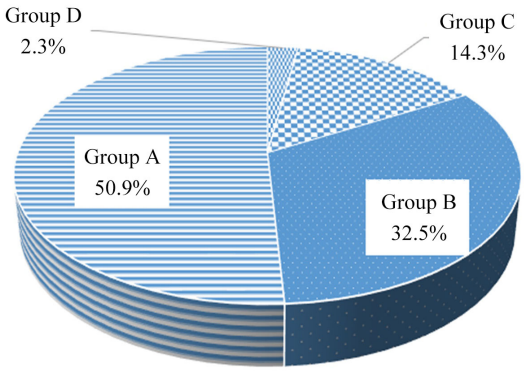

Figure 3. Post-test scores pie.

and reposting and learning performance. For example, Liu Zhi et al. found that there was a correlation between students' posting behavior and learning outcomes (Liu, Zhang, Sun, Liu, Peng, & Zhang, 2016), and Luo Heng et al. also discovered through experimental research that the total number of words posted on the forum had a relationship with learning outcomes (Luo, Zeng, & Yang, 2019). In the 5th session of SPOC teaching, the course team posted topics 45 times, the number of student-initiated posts was 15 and the number of replies was 2856, as shown in **Table 3**.

Table 3 demonstrates the poor forum discussion and low student participation. By reviewing the content of students' replies, we found that the replies were basically replies to teachers' postings, with little communication between students. There are two main reasons for this: first, it has to do with students' study habits. Students are more used to asking teachers questions face-to-face than asking them online, as they find it more convenient and effective. Second, students lack confidence. Most students are not confident in their English and are too afraid to post or answer other students' questions for fear of making mistakes. Therefore, this shows that offline lessons (face-to-face class) are very necessary.

3.4.5. Learning Behavior in Relation to Academic Performance

To examine the correlation between online learning behavior and academic performance, the online learning behavior data collected from the 224 sample learners were analyzed using the Pearson correlation coefficient and the following results were obtained, as shown in **Table 4**.

From the results, we can find that students' learning performance was positively correlated with the number of visits to the course, the length of videos watched and the forum posts and replies, and especially had a strong positive correlation with the unit test scores, which is similar to the results of Luo Heng's study (Luo, Zeng, & Yang, 2019). Meanwhile, in order to further examine the relationship between learning behavior and learning achievement, students were segmented according to their final grades: 54 students in Section A (80 above including 80), 98 students in Section B (70 - 79 including 70), 51 students in Section C (60 - 70 including 60) and 11 students in Section D (below 60), and the statistical results of learning behavior and learning achievement of each group are shown in **Table 5**.

Table 3. Forum posts and replies (times).

Total Number of Posts	Total Number of Replies	Posts Per Capita	Replies Per Capita	Maximum Replies	Minimum Replies
15	2856	0.07	12.75	65	0

Table 4. Correlation between learning behavior and academic performance.

	Number of Course Logins	Video-viewing Length	Forum Posts and Replies	Unit Test Scores
Final Scores	0.1356	0.2109	0.2352	0.3606

Table 5. Average value of learner behavioral variables.

	Number of Course Logins	Video-viewing Length	Unit Test Scores	Forum Replies per capita	Final Exam Scores
Section A	421.5	745.6	90.4	20.4	82.3
Section B	301.4	648.4	85.3	16.2	72.5
Section C	223.9	602.1	72.9	11.5	68.4
Section D	189.8	434.2	58.3	7.4	50.3

Table 5 shows visually that students in Section A achieved an average final grade of 82.5, with each behavioral variable significantly higher than those in the other three Sections. 72.5 was the average final score of students in Section B, which was lower than that of Group A but higher than that of students in Sections C and D. The average final score of students in Section C was 68.4, which was close to that of learners in Section B. The average final score of students in Section D was only 50.3 points. The above data show that the more visits students make, the longer they study online, and the better students' performance; the higher the frequency of students' replies, the more time students devote to online, and the higher their performance on the unit test. Therefore, there is a correlation between students' online hours and their academic performance.

It should be noted that only 5 of the 224 students in this study were male, so the correlation between gender and achievement was not analyzed.

4. Conclusions and Implications

4.1. Conclusions

In conclusion, the SPOC-based ASMEC course reform meets the requirements of the "Internet + education" era, optimizes learning time, learning space and learning resources, provides a good idea to solve the dilemma of insufficient secondary time and unscientific and incomplete evaluation of traditional teaching, and fully reflects the requirements of the "student-centered" education and teaching mode change.

From the data analysis of students' online learning in this course reform, we also note that: first, students course log-in is high, video viewing and pre-study are good, and students' learning engagement is satisfactory, but the forum dis-

cussion is not active enough; especially interaction is rare. The main reason for this is that private university students are actually under more pressure than public university students, because the tuition fees for private students are much higher than public students, and they have a much harder time finding a job or furthering their study, which drives them to work hard in their studies. But as for the forum discussion, it is not active enough; especially the student-student interaction is rare. This is because the private university students have a weak academic foundation and are afraid to express their ideas in the forum. These are all evidenced in the course questionnaire. Second, in the SPOC mode, the teacher's ability to guide learning (especially how to increase students' motivation) has a direct impact on the number of student logins. Third, the number of course logins, the length of videos watched, forum discussions and unit tests have an impact on students' learning outcomes.

While this paper still has many limitations, mainly including the incomprehensiveness of the research population, as this paper only collected online learning data from students with one major of Zhejiang Yuexiu University. And the collection of learner online learning behavior data is still not comprehensive enough, for example, the duration of each login, the completeness of video viewing, and the relevance of the content of forum postings to the course, etc., which are closely related to the software development of the online platform and cannot be collected yet due to the author's limited authority and ability. In future research, the collection of online learning behavior data and learning effectiveness data will be further expanded to provide an in-depth understanding of the learning status of private university students, provide administrators and teachers with an overview of learners' learning status, and lay the foundation for tailored learning support services for learners in the learning process.

4.2. Implications

While it is undeniable that online learning behavior is influenced by numerous objective factors in addition to the learners themselves, the above findings can bring some insights into the course reform in private universities.

4.2.1. Providing Strong Support at Teaching Administrators' Level

Universities must set standards for SPOC course reform and take measures to further supervise and improve the quality of course teaching resources. At the same time, universities need to increase investment in hardware facilities, effectively improve network conditions, closely pay attention to SPOC course platform, timely solve all kinds of practical problems encountered by teachers and students in using the learning platform, and improve the convenience of using the platform. In this study, only some basic learning data can be collected on the online learning platform of the author's university, and more detailed data collection functions have not yet been realized, so in the future course reform, the university-level teaching managers should increase the investment and guarantee in this area.

4.2.2. Strengthening the Ability and Responsibility of Information Technology at Teacher's Level

To give full play to the supporting role of the network teaching platform and successfully apply the SPOC mode to teaching practice, teachers need to update their educational thinking and establish modern educational concepts, so that they fully realize that the SPOC teaching mode is an effective teaching mode that can better mobilize students' learning enthusiasm (Lu, Feng, Gu, & Wu, 2020). Therefore, the teacher in charge of the course should not only have solid professional knowledge, but also need to have strong information processing ability and high sense of responsibility. To strengthen the monitoring and guidance of students' learning progress, they can make use of the data analysis function through the platform to understand students' learning in real time, such as using brainstorming in group cooperation to create a relaxed discussion and communication environment to solve the problem of less interaction in online forums, and discovering students' difficulties and blind spots in time to make offline classroom teaching more relevant. At the same time, teachers should focus on strengthening the cultivation of students' learning ability in the implementation process, and guide students to realize that the cultivation of learning ability is more important than simple knowledge learning.

4.2.3. Focusing on Usual Performance at Students' Level

This study discarded the previous way of mainly summative evaluation in terms of student learning performance evaluation, and tried a multiple evaluation method combining diagnostic evaluation, process evaluation and summative evaluation, that is, the pre-test and post-test of each unit can provide the basis for diagnostic evaluation, the amount of student logins, the length of videos watched, the number of posts and replies to forum discussions, and the performance of face-to-face lectures can be used as references for formative evaluation, and the final grade was used as the main basis for summative evaluation, with appropriate reference to the online examination results. This all-round, whole-process assessment approach was well received by the students and aimed at guiding them to pay more attention to the accumulation of their regular studies.

The course reform based on SPOC mode promotes the comprehensive and deep integration of information technology and classroom teaching reform in universities, and is a useful exploration to deepen education reform in universities. Each private university needs to carry out positive pilot reform of course teaching according to the specific situation of the university, and make quantitative analysis and qualitative summary of the reform implementation effect in time, so as to promote the improvement of teaching quality and provide reference for the in-depth construction and application of SPOC courses in universities, and promote the change of education concept and teaching mode in universities.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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