Study and Practice of O2O Integration Teaching Model in the Era of “Internet +”

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Abstract. With the emergence of online teaching models such as MOOC and SPOC, the research and application of “Internet + Education” will bring about continuous updating of educational content, continuous changes in educational style, and increasingly diversified educational evaluation. This paper attempts to analyze the teaching models of online, offline and O2O (Online to Offline), study their operation mode, teaching mode and system innovation, and practice the basic course of programming as an example, in order to promote the "Internet + Education" for colleges.

1. Introduction
To comply with college curriculum reform, the class period of a course is being shortened gradually, which makes traditional teaching be caught in a dilemma: on the one hand, teachers need to arrange the compact curriculum content to complete the required content design in course outline; on the other hand, students have difficulty in following the teaching speed when receiving knowledge. In addition, students lack the consciousness and ability of independent learning, which leads to low study efficiency. As a result, they lose study confidence, and even have the school-weary psychology. Therefore, how to motivate students’ learning enthusiasm and improve teaching quality and effect within limited hours becomes an urgent teaching issue.

2. Analysis and Selection of Teaching Model
Several practices at the present stage indicate that the only online or offline teaching cannot replace each other. The offline teaching usually includes classroom teaching, practical teaching, offline discussion and other offline exchange activities, while the online teaching contains MOOC (Massive Open Online Courses), micro-courses, SPOC (Small Private Online Courses), online discussion and other online activities, among which MOOC and SPOC are representative with distinct characteristics.

2.1 MOOC
MOOC is interpreted from Massive Open Online Courses, which is characterized by large scale, openness, transparency and online nature. It consists of learners who are willing to share and cooperate so as to increase knowledge, thus achieving the high-end model of knowledge exchange.

With the emerging of Internet education, in particular MOOC, traditional and single classroom teaching model has been promoted, but the actual efficiency is not optimistic in college teaching after nearly a decade of development. The reason is that the teaching quality of MOOC is problematic:
- One of fundamental purposes of college education is to guarantee and improve the teaching quality and ensure most students’ course-completion. The proportion of the number of teaching-class within 20 students among the total teaching classes is taken as an important indicator for teaching quality evaluation in world’s famous universities. However, MOOC is a large-scale and open online course without the restriction of number of students, prerequisite courses and admittance, which goes against the teaching quality.
For learners whose initiative is poor, the teaching effect of independent learning is reduced significantly, resulting in the low degree of involvement and completion rate of MOOC.

The learning, tests and final examinations of MOOC are conducted through the online model, which lacks effective detection and monitoring and further makes students cheat easily. In this case, it is difficult to ensure each student’s learning status and quality. Meanwhile, it can also lead to the low recognition degree of MOOC’s certificate (or credit).

2.2 SPOC

SPOC is usually interpreted from Small Private Online Courses. As a typical curriculum paradigm in the “post-MOOC age”, it combines the education thought of MOOC with micro-courses, minor teaching and intensive education, forming its own educational pattern.

SPOC derives from MOOC with characteristics and advantages that differ from MOOC:

- SPOC is established based on its access conditions and student scale (registered students with the range from dozens to hundreds) set by course teachers. Thus, small-scale teaching and strong homogeneity make for good teaching efficiency and provide more targeted and greater professional support, so as to improve the teaching quality.
- Teaching resources of SPOC are selected by course teachers from MOOC’s videos, materials, online assignments and online tests. In addition, students are required to complete work within the specified time according to course teachers’ teaching schedule. Therefore, SPOC is an independent learning model, but it is a planning course, during which teachers can get involved in students’ learning process to ensure the degree of participation and completion rate effectively.
- As SPOC integrates the online with the offline teaching model, students can study online independently and initially, and then make face-to-face discussion, answer questions and do experiments in classroom. And further they review, practice, test, cooperate and discuss through online resources after class, and finally take online or offline examinations. The whole guidance on learning can avoid the phenomena of “vicarious learning” and “cheating” and further ensure the passing rate of courses.

3. Design and Practice of Teaching Model

The basic course of programming, which is a compulsory course for students who major in Computer and Information Management and is also a limited optional course for those who are in other schools, aims to develop students’ abilities of programming, thinking and practicing through an algorithmic language. With the characteristics of complicated content, strict structure and strong practicality, this course is suitable for exploring O2O teaching idea and model. The iCourse is used as the assisted teaching platform of SPOC in the Chinese University MOOC.

3.1 Selection of Teaching Resources

There are three development modes of SPOC course resources, namely introduction, transformation and self-building. The following factors should be considered if the private SPOC is established by means of introducing high-quality MOOC resources:

- Teaching aims: Programming, which is a professional basic course established for several years, has many course resources in MOOC. However, iCourse is allowed to join in one of MOOC courses, which requires that teachers should select the suitable resource according to teaching aims with more efforts in the preliminary stage.
- Teaching contents: Different teaching objects in different universities lead to the situation that the same course has different teaching contents, teaching difficulties and emphasis. If the difference is significant, the utilization rate of online resources will be reduced, which means that teachers have amount of workload like screening, adaption and supplement in the process of learning, practicing and testing. Meanwhile, students’ learning efficiency is also influenced by the difference.
- Selection of teaching materials: A lot of knowledge points in teaching are explained by means of referencing teaching materials. Thus, the difference between materials used in MOOC and the own material can also influence the convenience of learning.

3.2 Integration of Teaching Methods

Considering the teaching practice of the year and students’ feedback, it can be concluded that the classroom teaching and SPOC should develop and integrate simultaneously during the study, and should have their own emphasis according to different contents.

The basic knowledge of programming, such as expression, loop and array, is complicated, logical and difficult to understand independently. If the basic knowledge fails to be grasped, the subsequent programming is out of the question. Therefore, the classroom teaching is taken as the principal thing in the primary learning stage, and teachers can adjust teaching schedules and methods immediately according to students’ situations of listening and understanding. Meanwhile, the learning atmosphere in classroom can better ensure students’ quality of attending a lecture. At this stage, SPOC is more suitable for achieving its auxiliary functions like reviewing and consolidating what students have learned in class.

In the middle and later stage, students have acquired programming ability to a certain extent. In this context, some comprehensive training topics with strong designability and creativity can be added to the teaching so as to develop the independent and practical ability. Therefore, it is more appropriate to explore the feasibility of flipped classroom. The teaching mode should focus on learning, collaboration and communication of SPOC, with the classroom teaching as a supplement. Thus, more classroom time can be used for deep interaction between teachers and students as well as discussion of key and difficult points.

3.3 Diversified Assessment Methods

Tests and final exams of SPOC are available online, but cheating is an existing problem in online teaching. Therefore, the corresponding assessment method of the integration of online and offline needs to be formulated.

SPOC is applied in stage practices and tests. It can give students sufficient time and several assessment opportunities. Moreover, to get better grades, students are happy to do repeated exercises and discuss questions that they answer wrongly with teachers and classmates, which is useful for mastering relevant knowledge. In the meantime, the online automatic assessing system can not only save teachers’ time in judging homework, but also timely understand each student’s understanding of knowledge points according to statistical data provided by the system.

The offline computer-based test is used in final exams to make sure that the performance is authentic and effective. In the beginning of the semester, students know that they cannot cheat in final assessment, which is beneficial to correct their learning attitude. Another reason for using the offline test is that the automatic assessing function of online assessment is only for objective items like choice questions as well as true or false questions. It is difficult to give a proper rating for subjective items like programming. Using the offline computer-based test, teachers can better set up and regulate the question-setting and assessing system.

In order to evaluate the teaching quality and learning effect more objectively and accurately, this course adjusts the assessment method and proportion of the traditional assessment method, formulating the diversified assessment system including final exam, online learning, interactive communication and the operation effect of programming. The quantitative criteria of the two general assessments are shown in Table 1 and Table 2, respectively.

<table>
<thead>
<tr>
<th>Table 1. Criteria of the Traditional General Assessment.</th>
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<tbody>
<tr>
<td>Final result</td>
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<tr>
<td>Usual results</td>
</tr>
<tr>
<td>Programming</td>
</tr>
<tr>
<td>Question and discussion</td>
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Table 2. Criteria of the Diversified General Assessment.

<table>
<thead>
<tr>
<th>Criteria of the Diversified General Assessment</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final result</td>
<td>45%</td>
</tr>
<tr>
<td>Usual results</td>
<td></td>
</tr>
<tr>
<td>Classroom Question and discussion</td>
<td>15%</td>
</tr>
<tr>
<td>Test and practice</td>
<td>10%</td>
</tr>
<tr>
<td>Programming</td>
<td>10%</td>
</tr>
<tr>
<td>Interaction</td>
<td>10%</td>
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<tr>
<td>Online learning</td>
<td>10%</td>
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4. Investigation and Analysis of Teaching Quality

To better understand the using effect of SPOC, the teaching quality is analyzed from various aspects through questionnaires, statistical data from SPOC platform and performance summarization.

4.1 Data Analysis of Examination Performance

118 students took part in the course in this semester. The final data show that the final result has a linear monotonic increasing trend with the increase of the usual results online (40 as full score), with a higher linear fitting degree of the scatter plot between them \((R^2=0.8742)\), as shown in Fig. 1. This indicates that online learning is helpful for improving teaching quality and academic performance greatly.

4.2 Data Analysis of Watching Videos

The main resource for online learning comes from videos explaining knowledge points. Students can decide whether to watch them or not and how many times they watch them. As illustrated in Fig. 2, statistics show that 51.69% of students watch videos twice on average for each course, accounting for the largest; next, students watch videos three times, accounting for 39.83%; and 100% of students watch all videos. Students who rank the top three in the number of views, times and total time receive 96, 97 and 93 in the final result, respectively. Therefore, in order to motivate students’ enthusiasm for independent learning, the reasonable division of knowledge points and video recording are crucial for SPOC teaching.

4.3 Data Analysis of Discussion and Interaction

As an auxiliary teaching method, the satisfaction of discussion and interaction is investigated. The results indicate that 77.3% of students like to communicate with teachers and classmates in class or offline, while only 22.7% of students like to participate in discussion boards based on the course.
platform. The main reason for this is that the face-to-face communication is clearer for programming problems, which implies that the classroom teaching is irreplaceable to some extent.

Figure 2. The Number of Views on Average.

5. Conclusion

The learning style of online courses has reformed the traditional education environment. Since computer courses are common internationally, O2O integration teaching used for computer courses in universities is bound to have a promising development. However, the introduction of online teaching is not just about moving one course online or organizing various resources simply. The feasible O2O integration teaching model should be further explored under the credit system, so as to improve students’ ability of independent learning and guarantee the teaching quality.

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