Study on the Evaluation of Students’ Learning Effect under the “MOOC+SPOC”-based Mixed Teaching Mode

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Abstract. A students’ learning effect evaluation indicator system is a basis for objective evaluation of students’ learning effect and the key to promoting the learning process, guiding learning behavior, find deficiencies in learning and improving learning methods. Based on theories concerning traditional learning effect, the connotation of students’ learning effect under the “MOOC+SPOC”-based mixed teaching mode is analyzed and defined in this paper, and its learning effect evaluation indicators are determined and a novel innovative evaluation indicator system is constructed, with a scientific and effective method adopted to determine indicator weight. Theories relating to students’ learning effect evaluation are enriched in this paper, of certain practical significance for stimulating students’ learning motivation and improving students' learning quality.

Introduction

MOOC (Massive Open Online Courses) refers to a kind of massive free open online courses, also call “Mu Ke” in Chinese. Since 2012, the rapid development of MOOC has allowed more people to get access to abundant free learning resources and realized the democracy of education and possibility of lifelong learning. In spite of many advantages of MOOC, it has some shortcomings, such as high dropout rate of students, difficult interaction between teachers and students, inability to provide individualized instruction for all students and difficulty in ensuring teaching quality. In order to make up for the shortcomings above, SPOC has emerged at the right moment. SPOC is a “School-based” platform developed based on MOOC, called “Si Bo Ke” in Chinese, whose most important feature is its more focused on the each link of learning, with such characteristics as customized, private and fine-grained data service and teacher-student interaction function in a variety of ways[1]. The MOOC+SPOC-based mixed teaching is the bonding joint of MOOC and traditional classrooms, in which existing high-quality MOOC resources are utilized to improve the traditional classroom teaching efficiency and quality, teachers’ leading role in guiding, inspiring and monitoring the teaching process should be exerted, and the initiative, enthusiasm and creativity of students, as the subject of the learning process, should be fully reflected[2].

A scientific evaluation indicator system is the key to enhancing students’ learning effect. Coupled with the brand new design and practice of the “MOOC+SPOC”-based mixed teaching mode for the computer courses at H university, one of the key universities involved in China’s Project 985, the connotation of students’ learning effect is analyzed and defined, learning effect evaluation indicators are determined a novel innovative evaluation indicator system is constructed, with a scientific and effective method adopted to determine indicator weight.
Research Basis Related to Students’ Learning Effect under the “MOOC+SPOC”-Based Mixed Teaching Mode

Overview of relevant research

In recent years, many researchers have begun to study the issues concerning learning effect based on MOOC and mixed teaching modes. Jiang Lin, et al. (2013) conducted systematic analysis of the learning characteristics, learning effect and learning motivation of MOOC learners, summarized the learning motivation and learning capacity of MOOC learners and finally put forward suggestions for improving the learning effect of MOOC course learners[3]; Shen Xinyi (2015) designed a series of strategies for stimulating learning effect based on knowledge contextualization theories and peer evaluation, hoping to elevate students’ learning participation and learning enthusiasm through these strategies, thereby deepening students’ knowledge learning[4]. Pei Xiaqin, et al. (2015) stated the basic concepts of mixed teaching, analyzed the problems involved in the existing MOOC effect evaluation and considered the construction of a mixed teaching effect evaluation system from the perspective of MOOC[5], Ding Hui, et al. (2015), based on an MOOC -based mixed teaching mode, constructed a learning evaluation mechanism, including learning interaction evaluation, process evaluation and summative evaluation[6]. Zheng Yuanyuan, et al. (2015), with the information retrieval course of Shihezi University as an example, conducted evaluation of learning effect evaluation indicators for the information retrieval course under a mixed teaching mode[7]. Xie Maosen (2015) conducted reliability analysis and factor analysis of the students’ learning process evaluation self-rated questionnaire project under a space teaching mode, based on which students’ learning process evaluation rubric under the space teaching mode was determined[8]. Jiang Feng (2015) proposed a fuzzy mathematics-based online learning effect evaluation model, which uses the theory of fuzzy mathematics to conduct comprehensive evaluation of the effect of online learning.

Researchers have also defined the connotation of students’ learning effect from different angles: the Joint Committee on Standards for Educational Evaluation (America) thinks that students’ learning effect refers to expectations of students’ specific learning, i.e., various results to be achieved by students in terms of specific learning, attitude and values (emotion) and individual behavior. Janet Fulks thinks that students’ learning effect refers to the specific measurable objectives and results that students should achieve after learning. These results should include knowledge (cognitive), skills (behavioral) and attitude (emotional). The results above provide evidence that students have achieved the results of specific courses, professional activities and teaching process by learning.

Analysis shows that the research above is still relatively fragmented and unsystematic, thus involving different opinions and that determining an all-round whole-process evaluation indicator system is still an issue requiring in-depth research.

Definition of the connotation of students’ learning effect under the “MOOC+SPOC”-based mixed teaching mode

Based on theories relating to students’ learning effect and the characteristics of the “MOOC+SPOC”-based mixed teaching mode, the connotation of students’ learning effect is innovatively defined as: “a certain result and capability level obtained by students after learning in terms of knowledge, skill, attitude and emotions under the “MOOC+SPOC”-based mixed teaching mode”. This teaching mode depends on the massive open online learning environment of MOCC, with an interwoven network involving students, teachers, social media and course resources as the core, with the SPOC form as the service mode. The connotation of students’ learning effect evaluation is defined as: the evaluation subject continuously collects and analyzes information about knowledge and skill-related students’ ability improvement and emotional and attitude changes and uses the information as direct evidence to evaluate and judge learning effect against the initial setting of learning effect, find out problems involved in students’ learning and teachers’ teaching links and solve them targetedly and finally achieve higher education quality assurance goals of improving students’ learning effect and promoting students’ individual development. The
above research relating to students' learning effect has laid basis for the following research involved in this paper.

**Determination of Students’ Learning Effect Evaluation Indicators under the “MOOC+SPOC”-based Mixed Teaching Mode**

**Theoretical basis for determination of evaluation indicators**

**All-round learning effect evaluation**

Whether with a traditional course learning method or with a learning method in the MOOC environment or under the “MOOC+SPOC”-based mixed teaching mode, the evaluation of learning effect should not only focus on students’ academic performance, but also focus on finding out and developing students’ potentials in many aspects, learning about students’ demands in the development and helping students understand themselves and establish confidence. After learning, students can improve their cooperation ability, communication ability, practical ability, creativity, etc. Therefore, evaluation of learning effect should be comprehensive and additive. Obviously, the evaluation method based on test papers in the mid-term and final exams is not scientific, and it is necessary to establish an evaluation system based on all-round development of students to examine their learning effect.

**Whole-process learning effect evaluation**

The focus of learning effect under any mode shouldn’t be placed only on the result, without attention paid to the process. Only in the learning process, can students be inspired to conduct active reflection and summary, and only in this way, can their learning effect be of guiding significance.

SPOC has inherited some advantages of traditional online teaching and MOOC, and it is also development of and supplement to MOOD at the same time. The learning environment of SPOC has changed, so has learning factors. Therefore, the “MOOC+SPOC”-based learning process has particularities: first, a teacher can set the release time of each chapter and each unit, the deadline of each assignment submission, the deadline of peer evaluation, etc.; second, a teacher can organize exchanges and discussions and customize practice goals for students and get students’ timely feedback online and organize students’ group-based discussions and help learn SPOC offline, playing a bonding role in effectively connecting online and offline learning links; third, SPOC provides convenient, fast, automatic and all-round interaction functions and can help a teacher better manage students involved in SPOC and directly or indirectly increase students’ course participation. To sum up, SPOC learning involves not only online testing and assignment but also offline discussion, etc. So the particularities of the “MOOC+SPOC”-based mixed teaching mode require that comprehensive evaluation of students’ online and offline ability and attitude changes and grasp of knowledge points should be conducted in their learning process, only in which way, can students’ learning effect be improved.

**Determination of evaluation indicators**

Based on the theories above, coupled with computer course practice of H university, the indicators for evaluating the students’ learning effect under the “MOOC+SPOC”-based mixed teaching mode are determined.

**Students’ participation degree**

This evaluation indicator involves 3 sub-elements: online learning time, online chapter testing and online assignment submission. The length of online learning time can reflect students’ attention degree and cognition degree of problems, the longer students’ online learning time, the more thorough understanding of teaching content they have and the more solid grasp of learning objectives they have. Online chapter testing is an important part embedded in the teaching videos, and proper testing can not only help students consolidate knowledge and form skills but also inspire students’ thinking, cultivate students’ ability, fully mobilize students’ enthusiasm, stimulate
students’ interest in learning and better promote students’ meaningful learning. Students can examine their own learning effect quickly by actively completing and submitting assignment online, deepen their understanding of the knowledge learned and train their own thinking and imagination ability.

**Interaction situation**

This evaluation indicator involves 4 sub-elements: online exchange and discussion, online peer evaluation, offline group discussion and offline achievement show. The process of MOCC teaching is a process of interaction between teachers and students and between students to jointly fulfill the development objectives. The interaction in the online discussion area can better promote the discussion about course contents. Learners show more active participation behavior and get stronger concept application ability and critical thinking ability. Peer evaluation can help establish and maintain mutual trust between team members, realize effective communication and help mutually understand the knowledge learned and complete the assignment together. During offline group discussion organized by teachers, clear division of assignment between students can help improve their exchange and cooperation skills and strengthen their cooperative awareness. Students with good cooperative awareness can realize good exchange and regulation and get the best learning effect. Offline achievement show is the result of collective wisdom during students’ exchanges and discussions.

**Final comprehensive evaluation**

This indicator involves 3 sub-elements: online final exam, offline fine exam and offline experiment testing. This evaluation indicator is also summative evaluation, i.e. proper evaluation of the learning effect to be achieved, evaluation conducted to judge students’ learning effect after the teaching activity is over. It is evaluation of the final learning effect of students after a unit, a module or a term’s teaching is completed. The summative evaluation of the “MOOC+SPOC”-based computer course of H university is comprehensive evaluation of students based on online and offline mixed teaching mode, with the aim to conduct conclusive evaluation of students’ staged learning quality, improve learning effect and ensure teaching quality.

**Construction of an evaluation indicator system**

Based on the above, an evaluation indicator system has been constructed, including 3 primary indicators: students’ participation degree, interaction situation and final comprehensive evaluation; 10 secondary indicators: online learning time, online chapter testing, online assignment submission, online exchange and discussion, online peer evaluation, offline group discussion, offline achievement show, online final exam, offline final exam and offline experiment testing.

**Determination of Weights of Evaluation Indicators**

**Basis for determination of the weights of evaluation indicators**

Indicator weight is based on the general requirements of the teaching objectives of traditional courses and MOOC courses and in-depth interviews with relevant experts in the education circle and H university and the teachers in the “MOOC+SPOC”-based computer course teaching group, with the opinions of relevant teachers and students of other relevant MOOC courses solicited, with weight proportion analyzed based on sufficient investigation, with weight determined scientifically with a weight grade method.

**Rational analysis of evaluation indicator weights**

First, according to the “MOOC+SPOC”-based computer course examination outline and such factors as the role and application value of each primary indicator in the grasp of the knowledge contained in this course, the importance degree and position of primary indicators in the overall evaluation scope are studied and judged in a comprehensive way, based on which the proportion of each primary indicator is designed. Second, according to the characteristics and nature of the
“MOOC+SPOC”-based computer course, coupled with the importance degree and position of each primary indicator, the proportion of each secondary indicator in all evaluation indicator is designed. Through macro analysis, each indicator weight should comply with the objective of learning effect evaluation, and the proportion of each indicator in the whole evaluation system should match their importance.

**Calculation of evaluation indicator weights with a weighted mean method**

10 MOOC authoritative experts and 50 MOOC students from H university are selected for the research at this stage. Based on the analysis above, the weight of each evaluation indicator is allocated, with the average calculated based on the weight allocation values, with the average weight of each evaluation indicator obtained.

Calculation formula: \( Q = \frac{\sum_{i=1}^{n} x_{i} \cdot n_{i}}{n} \)

where, \( Q \) is average weight, \( x_{1}, x_{2}, x_{3} \ldots x_{k} \) are weight values of all evaluation indicators given by the evaluation subjects and \( n \) is the number of evaluation subjects. Based on the formula, the average weights of 3 primary evaluation indicators obtained by the 10 experts are 19.7, 29.5 and 50.2; the average weights of secondary evaluation indicators obtained by the 10 experts are 4.8, 4.6, 10.3, 5, 10.1, 4.7, 9.7, 19.3, 20.5 and 10.4. The average weights of 3 primary evaluation indicators obtained by the 50 students are 20.3, 30.6 and 50.5; the average weights of secondary evaluation indicators obtained by the 50 students are 5.3, 5.2, 9.8, 4.9, 9.9, 5.5, 10.3, 21.2, 19.9 and 9.4.

**Determination of evaluation indicator weights**

Based on the average weights of evaluation indicators obtained by the experts and students, in order to truly reflect the student-centered education concept of the “MOOC+SPOC”-based mixed teaching mode, it is determined that the evaluation indicator weights obtained by the students occupy 60% and the evaluation indicator weights obtained by the experts occupy 40%, based on which the evaluation indicator weights = average weights obtained by the experts×40%+average weights obtained by the students×60% is determined. Finally determined weights of 3 primary evaluation indicators are 20.06, 30.16 and 50.34, and weights of 10 secondary evaluation indicators are 5.1, 4.96, 10, 4.94, 9.98, 5.18, 10.06, 20.44, 20.14 and 9.8.

Through round-off of the digit after the decimal point of the weight value of each evaluation indicator, the finally determined weight allocation: 20, 30, 50 for 3 primary evaluation indicators and 5, 5, 10,5,10,5,10,20,20,10.

**Examination of learning effect evaluation on students at H university**

100 students have been randomly selected as samples from those who have completed the “MOOC+SPOC”-based computer course learning in the fall semester of 2015 at H university to examine the learning effect of the students based on the evaluation indicator weights and specific grading rules for each evaluation indicator. The full score of each evaluation indicator is 100 points, with the total score of an evaluation indicator calculated based on the weight of this evaluation indicator after scoring based on the special grading rules. For example, a full score is given when the online learning time of the computer course is 1000 minutes or more, with one point given for every 10-minute online learning; a full score is given when the assignment submitted online completely meets the assignment requirements, 80-100 points for the assignment that excellently meets the assignment requirements, 60-80 points for the assignment that basically meets the assignment requirements and less than 60 points for assignment that fails to meet the assignment requirements. Student A’s online learning time is 750 minutes, so this student gets 75 points. Calculated based on 5% weight of this evaluation indicator, the final score for the online learning time is 75×5% = 3.75 points; the assignment submitted by Student A basically meets the assignment requirements and is considered distinctive, the score is 80 points. Calculated based on 10% weight of this evaluation indicator, the final score for the online assignment is 80×10% = 8 points;

Based on the score calculation above, the 100 students’ total average score is 80.7 points, with the average score of 10 secondary evaluation indicators being 2.7 points, 4.2 points, 8.3 points, 3.8
points, 5.9 points, 4.5 points, 9.6 points, 15.3 points, 17.2 points and 9.2 points respectively, based on which it can be judged that the students’ overall learning effect in this course is good. However, the scores of online learning time and peer evaluation are slightly lower, showing poor learning effect in this link. It is suggested that appropriate measures should be taken.

Conclusions and Innovations

1. The connotations of students’ learning effect and evaluation under the "MOOC+SPOC"-based mixed teaching mode are defined in this paper and a novel and unique evaluation indicator system is constructed in an innovative manner.

2. A method of determining weights is put forward in this paper and this method can be adopted to determine the weights of evaluation indicators more scientifically.

3. Based on the evaluation indicator weights we have determined, the learning effect of the students at H university is examined.

4. Theories relating to students’ learning effect evaluation have been enriched in this paper, which is of certain practical significance for improving students’ learning effect: first, in terms of reference and basis functions, the indicator evaluation system can not only be used by teachers as basis for objective evaluation of students’ learning effect, but also be used by students as a tool for self-evaluation; second, in terms of guiding and promoting functions, the evaluation indicators can help students make clear their learning motivation, promote their learning process and guide their learning behavior; third, in terms of feedback and examination functions. Through the examination of students’ learning effect and examination result feedback based on the evaluation indicators, the problems existing in a certain link of students’ learning process can be found in a timely manner and solved by taking active measures to elevate students’ learning quality.

References


