

Research on the Effectiveness Evaluation of College Physical Course Online Instruction

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Abstract:

Online instruction has changed persons' learning experience, and its rise has changed instruction methods, content, and management. The evaluation of online instruction is the fundamental guarantee for learners to learn effectively. The development of online instruction will depend on whether online classrooms and offline classrooms can truly achieve "homogeneous equivalence". Based on the CIPP model, this paper analyzes the relevant indicators of online instruction evaluation at home and abroad and constructs an index system suitable for online instruction evaluation, including four dimensions of background, input, process, and output, covering 12 secondary indicators. The empirical investigation of learners participating in online studying in two different colleges of Harbin Sport University in China shows that 12 variables have a significant positive impact on the effectiveness of learners' online studying. Among them, the four variables of course background, online courses, instruction interaction, and professional output have the most obvious influence on the effectiveness of online instruction, and the professional type has a moderating effect. Learners majoring in sports humanities and sociology have higher online studying effectiveness evaluation than learners majoring in sports training. Teachers can effectively improve the effectiveness of online instruction by strengthening optimization behaviors such as online instruction process evaluation and adjusting online instruction behaviors and online activities according to professional categories such as theory and technical courses.

Keywords: *Physical course, Online instruction, Instruction effect, Evaluation.*

I. INTRODUCTION

With the development of science and technology and the progress of technology, modern education technology is closer to modern information technology, the education industry is undergoing rapid changes. In terms of teaching methods, in addition to the traditional offline teaching, the field of online education is booming, and more and more parents, teachers and students can accept this new teaching method. Online teaching not only breaks the limitation of time and space, reasonably and effectively integrates high-quality teaching resources, but also promotes the deep integration of information technology and education and teaching scenes, and promotes the development and progress of the education industry to a certain extent[1]. However, there are still some thorny problems in online teaching,

especially the quality of teaching is not high, especially affected by the new corona-virus disease, billions of college students in more than 200 countries in the world are in a crisis state of suspension. During the period of sudden epidemics, schools were affected to delay the start of school. To implement the requirement of the Ministry of Education of China, most schools adopted the online teaching method. Although the network technology and platform of online teaching have been mature and perfect, some students outside the screen are often unable to actively participate in the classroom due to the characteristics of space-time separation in online teaching. A small number of teachers cannot take it as seriously as offline teaching, and the quality of learning and teaching cannot be effectively guaranteed. So how to ensure the quality of teaching through effective means has become a hot topic for researchers.

Like traditional teaching methods, online teaching also needs to build an online teaching quality evaluation system. A scientific and objective online teaching quality evaluation systems can better promote and guide the healthy development of online education. A good online teaching quality evaluation system should run through the whole process of learning and form a closed loop. Evaluation information from online teaching can help teachers make decisions about students' learning outcomes, diagnose students' learning problems in specific areas, provide targeted feedback or additional support to students[2-4], and make conclusive judgments about scores or retention rates. In addition, this evaluation information can also help to assess the situation of online teaching to achieve students' learning outcomes, and can inform the decision to modify teaching materials or evaluation results are not correct, the academic curriculum for greater curriculum changes, select appropriate learning experience and technology to support these experiences, and even help educational administrators to record the curriculum and curriculum results for validation[5]. Online learning literature is relatively consistent that the importance of online teaching conveys students' learning outcomes, and how to evaluate these students' learning outcomes[6]. Best practice and instructional design models also support the use of online courses to help revise[7]. Liu (2020) believed that physical education online teaching during the epidemic period was completed by the interaction of teachers, students, and teaching media. Due to the space limitation of online teaching, teachers have many blind spots in the evaluation of physical education teaching effect, and the evaluation of the learning effect of sports technology cannot be fully followed up, which loses the significance of the physical education teaching effect evaluation[8].

At present, researchers focus on online course teaching design and organization of curriculum content, extensive planning, and design, according to the needs of students to adjust teaching, strengthen the relationship between teachers and students, timely feedback to students, continuous communication, the establishment of teacher existence and reasonable evaluation of the course, these are common themes. However, China's teaching evaluation is mainly the traditional mode of "learning to evaluate teaching". This single-mode has the problems of subjectivity and lack of learning data support, which cannot completely evaluate the teaching quality objectively. In addition, considering the space constraints of online teaching, there are many blind areas in the evaluation of teachers' online teaching effect[9-11], the evaluation model of online teaching-learning effect established by us helps to clarify this process and knowledge system for teachers, increase the standards and practical ability of effective online teaching, and provide suggestions for future research to promote the high-quality development of online teaching.

II. MATERIALS AND METHODS

2.1 CIPP Model

The CIPP model, also known as the “decision-oriented or improved-oriented evaluation model”, was proposed by Daniel L. Stufflebeam, a famous American educational evaluation expert, in the 1960s to overcome the limitations of Frederick Winslow Taylor’s target evaluation model[12]. Educational evaluation models aimed at promoting educational decision-making and educational improvement include context evaluation, input evaluation, process evaluation, and product evaluation. Background evaluation refers to the diagnostic evaluation of the environment, policies, opportunities for project implementation, and the needs of stakeholders, as required, including the evaluation of project background, project needs and possible difficulties, available resources, and opportunities; input evaluation is an evaluation of the resources required for the implementation of the project, including funds, facilities, institutions, personnel, regulations, and other resources, based on the background evaluation; process evaluation is the continuous evaluation and monitoring of whether the project is effective according to the plan, including the evaluation of project content, project quality, project implementation, and project evaluation; product evaluation is to evaluate the implementation results, including the project output and the satisfaction of stakeholders[13,14].

CIPP model integrates diagnostic evaluation, formative evaluation and assumptive evaluation[15]. It can evaluate the project before, during, and after the implementation of the project, evaluate the results of the project, and realize the continuous monitoring of the teaching process, which is helpful to management decision-making and project improvement. Therefore, based on the CIPP model, this study determines the online teaching evaluation index by combing and analyzing the relevant research on foreign online teaching evaluation and constructs the index system for the evaluation model of online teaching effectiveness. The dimensions and sub-indicators are shown in TABLE I.

TABLE I. Online teaching evaluation index system based on CIPP

PRIMARY INDICATORS	SECONDARY INDICATORS	TERTIARY INDICATORS
CONTEXT EVALUATION	Policy background	Policies, norms, planning
INPUT EVALUATION	Curriculum background	plan, system, structure
	System elements	system design
		system quality
		Technical infrastructure
	Teacher elements	Technical ability
		Teaching attitude
	Student elements	Learning purpose
Online learning ability		
Learning strategy		
PROCESS EVALUATION	Online curriculum	Curriculum design

	Teachers support	Curriculum implementation	
		Curriculum evaluation	
		Teaching support	
		Management support	
	Students support	Technology support	
		Academic support	
		Technical support	
	Teaching interaction	Administrative support	
		Classmate interaction	
		Teacher-student interaction	
	PRODUCT EVALUATION	Professional output	Academic performance
		General output	Student satisfaction
Teacher satisfaction			
Performance output		Cost-effectiveness	
	Teaching completion rate		

2.2 Data Sources

Harbin Sport University is a university dominated by sports disciplines, and large-scale online teaching began on March 11, 2020. During the whole semester of implementing online teaching, the number of online learners accounted for 76.5% of the total number of students, of which 170 samples were from the Institute of Physical Education and Training, accounting for 74.6% of the total samples. Sports humanities and social college students sample 58, accounting for 25.4% of the total sample. While conducting online surveys on students, online questionnaires were also conducted on teachers. There were 66 teachers interviewed, accounting for 21.2% of the total number of teachers in the same period. Teachers use more than 10 network teaching platforms. The questionnaire design of this study is based on the questionnaire template provided by the well-known third-party education data consulting and evaluation institution Max Research Institute. After full discussion by school experts and teaching managers, around the CIPP online teaching evaluation effect management goal, the questionnaire was moderately modified. A total of 12 necessary answers were set up, and the Likert five scale was used to construct the structural equation model. The data were statistically analyzed by AMOS 21.0 software.

III. CONCLUSION

3.1 Evaluation of Online Teaching Evaluation Model Based on CIPP Model

The Cronbach's Alpha of the sample group of the two college students is 0.933, 0.928, and 0.931 (> 0.7 is high reliability), indicating that the questionnaire has high reliability and good data reliability (TABLE II). Through data analysis, it is found that external variables are significantly correlated with overall satisfaction at a 0.01 level (bilateral), indicating that each variable significantly affects satisfaction. For the full sample, the correlation coefficients between curriculum background, online curriculum,

teaching interaction, and professional output are relatively high. In the grouped samples, the scores of students from the Institute of Physical Education, Humanities and Society are significantly higher than those of students from the Institute of Physical Education and Training, indicating that the former has a better online teaching effect than the latter.

TABLE II. Model variables and evaluation index data statistics

EVALUATION PROJECTS	OBSERVATION VARIABLES	FULL SAMPLE (N=228)		HUMANISTIC STUDENTS N=(58)		EDUCATION STUDENTS N=(170)	
		Mean value	Correlation coefficient	Mean value	Correlation coefficient	Mean value	Correlation coefficient
CONTEXT EVALUATION	Policy background	8.025	0.493**	8.214	0.467**	7.960	0.496**
	Curriculum background	7.993	0.614**	8.214	0.590**	7.917	0.617**
INPUT EVALUATION	System elements	7.895	0.605**	8.144	0.569**	7.808	0.611**
	Teacher elements	7.975	0.594**	8.235	0.569**	7.883	0.597**
	Student elements	7.816	0.608**	8.181	0.579**	7.690	0.610**
PROCESS EVALUATION	Online curriculum	7.866	0.658**	8.224	0.644**	7.743	0.657**
	Teachers support	7.934	0.584**	8.278	0.591**	7.815	0.577**
	Students support	8.069	0.621**	8.270	0.601**	7.999	0.623**
	Teaching interaction	8.138	0.639**	8.295	0.609**	8.081	0.644**
PRODUCT EVALUATION	Professional output	7.852	0.657**	8.082	0.644**	7.774	0.656**
	General output	7.933	0.574**	8.278	0.581**	7.815	0.587**
	Performance output	7.865	0.593**	8.224	0.643**	7.743	0.596**

Note:**Represents a significant (bilateral) correlation at a 0.01 level.

3.2 Overall fitting degree and hypothesis testing of the model

The structural equation model is constructed and the data is analyzed by AMOS 21.0 software. The design of the problem is based on the existing research and is fully discussed by experts and teaching managers, so it has certain content validity. The questionnaire has high reliability and good internal consistency. In the structural equation, 12 variables were observed variables. In the data output model adaptation index, RMR was $0.00 < 0.05$ and GFI was 1. The values of NFI, IFI, and CFI in the value-added adaptation index are 1. Therefore, from the perspective of the main adaptation indicators, the research model has a good fitting degree and can be adapted to the actual data. The regression coefficient parameters were estimated by the maximum likelihood method. The results showed that the regression weighted values of the whole sample, the student sample group of the Institute of Physical Education and Humanities, and the student sample group of the Institute of Physical Education and Training were all significant, t values were greater than 1.96, and H_1-H_{12} was accepted, and the original hypothesis was established. By comparing the data of students, it is found that the coefficients of path 2, 5, and 9 are quite different, indicating that the influence of student professional types on variables is moderate, and the original hypothesis is established (TABLE III).

TABLE III. Path coefficient and hypothesis test results

HYPOTHESIS		FULL SAMPLE (N=228)			HUMANISTIC STUDENTS N=(58)			EDUACATION STUDENTS N=(170)		
		Estimate	C.R.	P	Estimate	C.R.	P	Estimate	C.R.	P
H ₁	Policy background	0.046	6.148	***	0.045	3.172	**	0.043	4.916	***
H ₂	Curriculum background	0.122	13.088	***	0.099	5.284	***	0.129	11.953	***
H ₃	System elements	0.064	7.124	***	0.063	3.290	**	0.063	6.104	***
H ₄	Teacher elements	0.056	6.166	***	0.071	4.036	***	0.053	4.985	***
H ₅	Student elements	0.084	9.266	***	0.058	3.232	**	0.091	8.709	***
H ₆	Online curriculum	0.189	21.396	***	0.186	9.814	***	0.191	12.949	***
H ₇	Teachers support	0.080	8.476	***	0.066	3.488	***	0.084	7.673	***
H ₈	Students support	0.079	9.752	***	0.128	7.556	***	0.066	7.107	***
H ₉	Teaching interaction	0.208	21.630	***	0.205	10.933	***	0.209	18.641	***
H ₁₀	Professional output	0.108	11.630	***	0.089	7.733	***	0.181	8.541	***
H ₁₁	General output	0.098	8.630	***	0.078	6.923	***	0.097	7.643	***
H ₁₂	Performance output	0.101	9.630	***	0.093	5.934	***	0.123	7.941	***

Note: *** indicates $P < 0.001$; ** means $P < 0.01$.

3.3 Main conclusions of simulation evaluation

Online and offline teaching present different carriers of knowledge, but teaching in principle has overlaps. The empirical study finds that in this large-scale online teaching practice, the leading role of teachers and the dominant position of students are more obvious without changing the relationship between teaching and learning. The process evaluation has become the main factor affecting the effectiveness of students' online learning. According to the full sample-path coefficient, it is found that the four variables of course background, online course, teaching interaction, and professional output have the most obvious influence on the effectiveness of online learning. In this context, it is of great significance to bring students, teachers, parents, managers, and other stakeholders into online teaching evaluation. In the post-epidemic era, whether the spring of online teaching can come depends on the change and optimization of teachers' teaching behavior and its influence on students' learning, and whether online classrooms and offline classrooms can truly achieve "homogeneous equivalence".

3.4 Main practical recommendations of simulation evaluation

The online teaching system is a complex social ecosystem, including multiple subjects such as teachers, students, parents, and managers, and various factors such as policies, courses, teaching activities, teaching methods, and teaching processes. The interaction between various subjects and elements has an important influence on the quality of online teaching. Taking into account the participation of different subjects in different stages of the course, different subjects can be investigated at different stages. Such as in the input

evaluation stage, the government managers, students, parents to investigate, can comprehensively examine the background of curriculum implementation and students' learning needs; in the process evaluation stage, the online teaching activities, online interaction, and teacher-student support can be evaluated through the investigation of managers and teachers and students. In the result evaluation stage, managers, teachers and students, parents, and other subjects of online teaching can also be investigated to comprehensively evaluate the effect of online teaching.

3.5 Research Limitations and Prospects

In the process of practical application, quantitative and qualitative evaluation methods can also be used to comprehensively and comprehensively evaluate the whole process of online teaching according to different stages of online teaching. One or several evaluation indexes can be selected according to the needs for targeted evaluation. If the rationality and feasibility of the online teaching plan are analyzed, the online teaching background and input indicators can be selected for evaluation. Quality monitoring of the online teaching process can select the relevant indicators of the online teaching process to evaluate. The overall evaluation of the effect of online teaching can choose the relevant indicators of online teaching output to evaluate. In addition, the weight of each indicator is not allocated in this study, and the indicators of each dimension are only the main indicators. In the follow-up study, we will use the analytic hierarchy process to further adjust and improve the index system, and determine the weight of each indicator and the evaluation standard, to provide effective support for the theoretical and practical research of subsequent online teaching evaluation.

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