

A Study on the Evaluation of University Teaching Effect under the "Multiple Development Simultaneously and Three Steps" Practice Education System



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Abstract

In order to better adapt to the new requirements of economic and social development and industrial transformation on talent training, local colleges and universities will transform into excellent application-oriented universities, and increase efforts to cultivate multi specification and diversified application-oriented and compound talents. This paper establishes a teaching effect evaluation system based on students' achievements, and studies the impact of the "Multiple Development Simultaneously and Three steps (MDSTS)" practical education system on undergraduate teaching effect by using multi-factor ANOVA and multiple regression model. Through the analysis of the teaching effect of the public courses of Beijing Wuzi University, it is found that adopting the practical education model of MDSTS can not only effectively reduce the impact of the epidemic on teaching, but also through timely feedback of teachers' teaching effect, teachers can timely adjust the teaching method, implement innovative and applied teaching methods in each stage, and enhance teachers' attention to students' teaching effect through phased assessment, It can effectively improve the overall teaching effect.

Keywords

Multiple Development Simultaneously and Three Steps, Practice education system, Teaching effect evaluation, College student

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1. Introduction

China's higher education has entered the popularization stage. More than 95% of China's higher education institutions are local universities mainly managed by the provincial government. Among them, second-batch universities undertake the enrollment of 30% or more undergraduates, and second-batch universities are the realization and support of the goal of building a powerful country in higher education. In order to better adapt to the new requirements of economic and social development and industrial transformation on talent training, local universities will transform into excellent application-oriented universities, and increase efforts to cultivate multi-specification, diversified application-oriented and compound talents. In the process of talent cultivation, building a bridge between knowledge system and practical application, and cultivating students' innovation ability based on application oriented professional knowledge and skills are

the key points of teaching reform in high-level application-oriented universities.

When building a high-level application-oriented local university, Beijing Wuzi University has adopted a practical education system of MDSTS, integrating and sharing multiple resources from multiple dimensions (resources-teachers-teaching) and multiple measures. Young teachers must take temporary training in enterprises, expand horizontal scientific research project cooperation, and build a bridge between teachers in schools and enterprises. The off-campus tutors cooperate with the teachers on campus through demonstration teaching, lectures, project guidance, participation in laboratory construction planning and other forms to bring the latest industry trends, technology application cases and solutions to students, and form a good complement with the resources on campus. In each link of talent training, we should design the reform measures of innovative thinking, innovative knowledge and innovative ability. Since the education model was launched in 2019, whether the students' professional knowledge, skills and innovation ability have been improved requires an objective evaluation. This paper established a teaching effect evaluation system based on students' achievements, and objectively evaluates the effect of the MDSTS practical education system.

Many scholars use diversified teaching methods, personalized teaching systems, and practical teaching methods to evaluate the teaching effects of physical education, English teaching, and practical teaching (D. Jin, 2021; H. Chen, 2021; Y. S. Wang, 2021). It has been proved that factors such as the final results of the last semester, students' self-control, whether they have the habit of previewing, teachers' age, and teachers' qualifications will affect the evaluation of teaching effectiveness (W. L. Zhu, D. H. Li, & J. H. Chen, 2021; S. Bianchini, 2015). The core content of teaching effect evaluation includes evaluation index system and evaluation model. In terms of the teaching effect evaluation index system, Su combined with the Kirschner model of online teaching to build the teaching effect indicators and their weights at the reaction level, learning level, behavior level and result level (B. W. Su, S. P. Zhao, & Q. L. Hu, 2021). Yan combed the study of learning mode under the mixed teaching mode in China and evaluated the learning effect in five aspects: convenience, time cost, classroom explanation, acceptance and mastery (Z. M. Yan et al., 2020). In terms of teaching effect evaluation model, some scholars use fuzzy comprehensive evaluation method and customer satisfaction index model to evaluate the teaching effect based on the data of questionnaire survey (L. F. Lin & Q. W. Yang, 2021; Y. Long, 2019); Some scholars use principal component analysis and Markov chain model to evaluate the teaching effect based on students' performance data (C. Q. Wang, 2020; X. Y. Wang, 2019); Some scholars try to use artificial intelligence methods to evaluate students based on their behavior and performance data (N. Zhou & J. S. Zhou, 2021; D. He & N. Luo, 2021). Few studies are based on real achievement data to evaluate the teaching effect of a certain educational model. Therefore, based on the data before and after the implementation of the education model, this paper uses multi factor ANOVA and multiple regression model to evaluate the teaching effect under the education model.

2. Comprehensive Evaluation of the Teaching Effect under the MDSTS Education Model

2.1 Data Source and Description Statistics

Select the students' public course scores before and after the practice education system of MDSTS adopted by Beijing Wuzi University as the research object, and analyze the implementation effect of the practice education system.

Before adopting the practical education system, College English 4 (CE-4) had the lowest score, with an average score of 56.99, and Mao Zedong Thought and Introduction to the Theoretical System of Socialism with Chinese Characteristics (MZT) had the highest score, with an average score of 74.31. The standard deviation (SD) is relatively small, and the data distribution is relatively centralized. After the adoption of the practical education system, College English 4 has the lowest average score of 61.15, and MZT has the highest average score of 67.82. The gap between disciplines has decreased, and the standard deviation has generally decreased. The practice education system has an impact on the teaching effect of students' public courses, effectively improving students' public course performance and reducing the gap between courses.

Table 1. Descriptive Statistics of Final Scores of Different Courses before and after the Practical Education System

	Courses	Mean	SD
Before	CE-2	63.12	10.10
	CE-4	61.15	12.02
	MZT	67.82	14.30
After	CE-2	59.37	11.27
	CE-4	56.99	12.14
	MZT	74.31	14.32

2.2 The Overall Influence of the Practical Education System on the Teaching Effect

The teaching effect is affected by many factors. It is necessary to exclude the influence of other factors on the teaching effect. The total evaluation results of public courses before and after the adoption of the practical education system are selected as the research indicators. The impact of the practical education system on the teaching effect is studied by using the multi-factor analysis of variance. The results are shown in Table 2.

Table 2. The influence of practice education system, grade and curriculum on the overall evaluation results

	Class III sum of squares	Freedom	Mean Square	F	Significance(p)
Revised model	149610.376	10	14961.038	200.503	<0.001
Intercept	428387.792	1	428387.792	5741.115	<0.001
Practice education system	5546.41	1	5546.41	74.331	<0.001
Course	3530.936	2	1765.468	23.66	<0.001
Grade	4766.45	2	2383.225	31.939	<0.001
Practice education system*Course	0.013	1	0.013	0	0.989
Practice education system*Grade	0	0			
Course*Grade	1643.371	3	547.79	7.341	<0.001
Practice education system* Curriculum * Grade	0	0			

The total score of students is significantly affected by the curriculum, grade and practical education system. The interaction between the practical education system and the curriculum has no significant impact on the teaching effect ($p=0.989$). The interaction between the curriculum and grade has significant impact on the teaching effect. It is further found that there is a difference in the overall score between MZT ($p<0.001$) and CE-2 ($p<0.001$), and there is a difference in the overall score of 2019 compared with 2017 ($p<0.001$) and 2018 ($p<0.001$), as shown in Table 3.

Table 3. Two by two comparison of the influence of grades and courses on the overall evaluation results

(I) Factor	(J) Factor	Mean value difference (I-J)	Standard error	Significance(p)	95% Confidence interval (lower limit)	95% Confidence interval (upper limit)
CE-2	CE-4	-0.1739	0.23327	0.456	-0.6311	0.2834
	MZT	-8.3063	0.23317	0	-8.7634	-7.8492
CE-4	CE-2	0.1739	0.23327	0.456	-0.2834	0.6311
	MZT	-8.1324	0.23285	0	-8.5889	-7.676
MZT	CE-2	8.3063	0.23317	0	7.8492	8.7634
	CE-4	8.1324	0.23285	0	7.676	8.5889
2017	2018	0.2886	0.21259	0.175	-0.1281	0.7053
	2019	1.3119	0.28574	0	0.7518	1.872
2018	2017	-0.2886	0.21259	0.175	-0.7053	0.1281
	2019	1.0233	0.26965	0	0.4947	1.5519
2019	2017	-1.3119	0.28574	0	-1.872	-0.7518
	2018	-1.0233	0.26965	0	-1.5519	-0.4947

The practice education system of MDSTS emphasizes the process assessment. Through the dynamic analysis of students' academic performance, the teaching mode is adjusted in time. Therefore, the final grades of public courses before and after the practice education system are selected as the research indicators to conduct a multi-factor single variable analysis. The results are shown in Table 4.

Table 4. The influence of practice education system, grades and courses on final grades

	III Sum of Squares	Freedom	Mean Square	F	Significance(p)
Revised model	282242.195	10	28224.219	181.402	<0.001
Intercept	302505.93	1	302505.93	1944.262	<0.001
Practice education system	3057.973	1	3057.973	19.654	<0.001
Course	4075.214	2	2037.607	13.096	<0.001
Grade	4876.83	2	2438.415	15.672	<0.001
Practice education system*Course	152.262	1	152.262	0.979	0.323
Practice education system*Grade	0	0			
Course*Grade	1430.471	3	476.824	3.065	0.027
Practice education system* Curriculum * Grade	0	0			

The final scores of students are also significantly affected by the curriculum, grade and practical education system. The interaction between the practical education system and the curriculum has no significant impact on the teaching effect ($p=0.323$), and the interaction between the curriculum and grade has no significant impact on the final scores ($p>0.01$).

2.3 The Influence of Practical Education System on the Teaching Effect of Courses

The teaching effect of students is comprehensively affected by the curriculum and grade. Through the difference of the teaching effect of a single course after the adoption of the practice education system, the specific role of the practice education system on the curriculum is analyzed. Here we take CE-1 as an example. CE-1 is a compulsory course for freshmen after admission, and it is less affected by the previous courses. Taking College English 1 as an example, we can exclude the impact of the teaching effect of students' previous courses on the subsequent courses.

Through the T-test, the average score of CE-1 before the epidemic was 63.08, and the average score after the epidemic was 68.6134, with an average difference of 5.5334. Under the condition of the significance level of 0.05, the score difference of CE-1 was significant ($p=0.012$), as shown in Table 5.

Table 5. Test of differences in CE-1 students' scores before and after the practice of the education system

	M	SD	t	p
Before	63.08	29.52		
After	68.61	21.23	-2.53	0.012

3. Research on the Teaching Effect of the "Three steps" Practical Teaching System

The "three steps" practical teaching system emphasizes the process assessment. In the teaching process, teachers dynamically adjust the teaching methods according to the students' usual achievements, and apply innovation throughout the whole teaching process. By analyzing the relationship between students' total scores and their usual scores and final scores, this paper discusses the teaching effect of the "three steps" practical teaching system. For the courses that adopt the "three steps" practical teaching system, generally three ordinary grades will be provided. Three ordinary grades and final grades will be selected to establish a multiple regression equation. See Table 6 for details. The total score of students is significantly and positively affected by the final and usual scores ($p<0.01$). The specific multiple regression equation is:

$$Y_{Total\ score} = 0.50X_{Final\ score} + 0.19X_{Usual\ score1} + 0.21X_{Usual\ score2} + 0.15X_{Usual\ score3} - 4.44$$

Table 6. Multivariate regression analysis of usual and final scores on total scores

	R^2	$F(df)/P$	B	β	t	P
Constant			-4.44		-28.80	0.00
Total score		168053.16	0.50	0.61	451.93	0.00
Usual score1	0.99	(4,1183)	0.19	0.31	200.61	0.00
Usual score2		0.00	0.21	0.28	158.93	0.00
Usual score3			0.15	0.12	85.67	0.00

After the "three steps" practical teaching system is adopted, the usual scores can effectively predict the total scores of students. Among them, the influence of the teaching effect in the first and second stages is greater than that in the third stage. Teachers should pay attention to the students' learning in the first and second stages when implementing the "three steps" practical teaching system.

4. Conclusions and suggestions

The research shows that the practice education system of MDSTS has a significant impact on the teaching effect of students. Through phased assessment, innovative application of teaching methods can be implemented in each stage one by one, and teachers' attention to students' teaching effect can be improved effectively. Since the practical education system was implemented during the epidemic, the demonstration shows that the system has effectively resisted the epidemic, brought about teaching impact and influence, and the teaching effect is even higher after the epidemic than before. Therefore, the practical education system of MDSTS is enlightening for the teaching reform of local application-oriented high-level universities.

Conflicts of Interest

The authors declare there are no conflicts of interest regarding the publication of this paper.

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