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Research on Internet Education and Teaching in Higher Vocational Schools of China

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ABSTRACT

In the 21st century, the Internet is developing at an alarming rate, affecting all aspects of people, a large part of which is education. At China's 12th National People's Congress in 2015, Premier Li Keqiang proposed an "Internet Plus" action plan in a government report. "Internet + education" is one of the important categories, a new education model that combines Internet technology and education. The construction of Internet + education pilot colleges and universities can effectively solve the problems of insufficient educational resources and unbalanced allocation in underdeveloped areas and realise the "overtaking" of education. After the outbreak of the epidemic 20 years ago, Internet education has become the main medium and means of education in China. This article is intended to take the development of online classrooms in a pilot higher vocational college in Ningxia under the background of the new crown epidemic as an example, using the reviews software, through the changes in the grades of 1798 students; it is deeply proved that "Internet + education" has a positive impact on students' grades. Using factor analysis to comprehensively evaluate the performance of 347 students who have received Internet education, we put forward relevant suggestions for promoting and regulating the sustainable development of Internet education.

Keywords: Comprehensive evaluation; education equity; education model; factor analysis; Internet education; resource allocation.

Introduction

In December 2019, a case of COVID-19 emerged in Wuhan, Hubei, China. Due to the long incubation period of the virus and the characteristics of human-to-human transmission, the new coronavirus pneumonia rapidly developed into a large-scale nationwide epidemic (Tiejun, 2021). On January 29, 2020, the Ministry of Education of China issued a notice of "suspending classes but not learning", calling on all schools to conduct online teaching (Tiejun, 2021). It is also the first time online teaching has been carried out on a large-scale and universally throughout China. Through this epidemic, we find that the transformation of the education and teaching model is destined to happen. However, the large-scale and

template-based education centred on the class teaching system in industrial civilization is no longer respected by people in today's educational situation. Education has gradually transformed into a personalised and diversified way, and blended learning based on online and offline will inevitably become the development trend of future education. In the 21st century, human society has gradually entered an information society. Computer technology, communication technology and multimedia technology, as the basis for supporting information technology, are all developing at an unprecedented speed. Today, online education is a new form of education spawned by the development of modern information technology. It is an important means to build a lifelong learning system for people in the era of the knowledge

economy (Hislop, 2009). Using various technical media, it can contact teachers and students, carry course content and provide two-way information exchange. Individual students can also utilise various learning media to achieve their learning goals throughout their study period. Online education is not limited by time, space, region and ethnicity, and the education target is for the whole society (Yang & Yuan, 2021).

Whether or not online education is effective in this context is of particular concern to me, so I decided to use models to design and calculate the effectiveness of online education. In this way, schools and teachers can re-examine the opportunities and challenges faced by online education and analyse the current situation and existing problems. I implemented correct design targeted teaching strategies, hoping to provide some experience and strategies for the quality of all online teaching.

Literature Review

The Development of Online Education Abroad

According to the meaning of the Second Theorem of Welfare Economics, if the government can achieve education equity for the people through various policies, it can theoretically achieve effective economic efficiency (Xiong et al., 2014). Germany specifically formulated a distance education law to ensure the fairness of educational resources years ago. Germany vigorously promotes digital construction, and its Massive Open Online Course (MOOC) education can be traced back to 2011. In April 2011, Germany's first MOOC OPCO11 was launched at the University of Frankfurt, marking the official landing of MOOC in Germany (Yan, 2021). At present, German educational MOOCs generally feature seven platforms and four main bodies. The seven MOOC platforms include OpenHPI, Mooin-Oncampus, Leuphana Digital School, Mooc.tu9, and OPEN vhb, five independently operated platforms by universities and two major operator platforms, Iversity and Open Course World (Daniela et al., 2016). According to Daniela et al. (2016), the main body of the operating technology platform can be divided into four main bodies: the independent operation of universities or scientific research institutions, the cooperative operation between universities, the subordinate operators of universities and the pure operator platform. Each platform has different orientations according to the nature of its subjects, and the course categories have their emphasis (Daniela et al., 2016). The optional courses range from undergraduate and master courses to vocational education, from

high-tech to literary creation. Other MOOC platforms in the education field include the non-profit Amateur University Alliance (VHS), which only provides continuing education courses, and MOOC House, which is aimed at middle school students (Yan, 2021). Up to now, around 85% of German universities already run their own learning management system. Therefore, German MOOCs generally reflect the characteristics of diversity, starting from Germany and facing the world.

Since 1990, the British government has attached great importance to the development of online education and invested a lot of money in this field. This makes the United Kingdom one of the earliest countries in the development of high-level online education, and it has become one of the main types of modern education (Ran, 2013). The quality of online education is also considered to be equivalent to that of face-to-face education, and tuition fees are the same as on-campus courses. MyTutorWeb, a well-known British online tutoring service website, was founded in January 2013 to provide personalised online education services: each online course is one-to-one and tailored for each student. It is worth mentioning that the site also attracts students from countries other than the UK (Ran, 2013). Currently, the UK's School Jotter is the UK's #1 school website builder and online learning platform. It started its operations in 2003 by providing online platforms and software construction for thousands of schools in the UK (Sun & Chen, 2016). In primary and secondary schools and universities dominated by traditional teaching models, online education has long been applied to the normal teaching process of schools.

As the birthplace of the Internet, the United States has formulated the "Internet 2" plan to ensure the priority use of online education by institutions of higher learning and scientific research institutions (Yu, 2012). Now it has undergone many developments and iterations and has entered the segmentation era. The famous Khan Academy is the most typical MOOC classes. The students who take courses at Khan Academy can watch instructional videos, do online exercises and have Q&A tutoring (ŞAn & Aykaç, 2020). The site also offers free digital textbooks covering multiple areas (Chova et al., 2013). The practice system has students' complete practice records for each question, which can be tracked and referenced by teachers and taught according to students' abilities (ŞAn & Aykaç, 2020). This kind of teaching mode is more suitable for people at university or above. During the 2020 epidemic, various online education platforms flourished in Silicon Valley at the forefront of technological development (Internet education). For example, Harvard University provides 900 online

courses, for non-school students and school students, which has become a new way of education and teaching. In fact, online education has become an important part of American universities running schools around the world, which indirectly increases the penetration rate and global influence of American education (Chova et al., 2013). Therefore, from the perspective of international effect, online education is likely to become an effective way of international higher education and preparatory education in the future.

Differences in Educational Levels in China

With the gradual acceleration of development, it is difficult for economic benefits to be shared equally by all strata, and inequity in education has begun to show a trend of class solidification, institutionalisation and generation-to-generation transmission (Xiong et al., 2014). There are also various comments in society, such as “carps are difficult to leap over the dragon gate” and “poor families are difficult to produce noble children” (Zhang et al., 2020). The economic differences in most regions of our country are very significant, especially the obvious gap between developed areas and poor and remote areas and urban and rural areas (Xiong et al., 2014). In rural, poor or remote areas, although China’s investment in education increases every year, due to the low level of social and economic development in the area itself, the basic conditions for running some schools have not been guaranteed (Golley & Kong, 2018). Many inadequate school facilities cannot properly meet the needs of schools for teaching and student learning. In addition, due to the lack of functional supervision in the education system, some families do not pay enough attention to student learning, resulting in a high dropout rate (Xiong et al., 2014). Most of the outstanding young people or key schools’ teachers have also lost a lot of money because of poverty, remoteness or lack of emphasis on teaching (Zhang et al., 2020). For this reason, it is difficult to improve teaching quality in remote schools, directly restricting the development of schools in remote areas and the guarantee of teaching quality.

Every ordinary family often thinks that improving academic qualifications is the most important task for students because of China’s special test-oriented education background. Teachers cannot teach students according to their aptitude, even when faced with students who are very different and have different needs. Every child of different individuals is treated in the same way of education, regardless of individual differences, but in the pursuit of uniformity (Golley & Kong, 2018).

Over time, the lack of individuality and diversification of children has resulted in a very weak sense of independence and self-determination of students, and children’s creative thinking has also been limited. This is also one of the reasons that lead to the inequity of education in different regions and the imbalance of education in different regions.

In order to improve the social phenomenon of inequity in education, the state has introduced a series of national policies and measures. To promote “Internet + education” is essentially to combine the Internet platform and related technologies with traditional educational concepts to realise the education reform, create a new education format, achieve higher quality education and return to the essence of education. Internet + education is a new form of the information age (Guan, in press). It is the reintegration of various resources between Internet technology and Internet thinking to achieve a more efficient allocation of resources.

The Development of Online Education in China

Education is the most important part of a country, and inequality in education is a global issue. There are still unbalanced and unreasonable distribution of educational resources in global education (Dhawan, 2020). Especially for a country like China, where human resources are over-distributed and unevenly distributed, improving inequality in basic education is a huge challenge.

Internet education takes the Internet as a channel and platform, gives full play to the advantages of Internet education resources, and uses various information technology means and forms of expression. In order to achieve the purpose of disseminating digital education content for users with different needs and providing high-quality education services anytime and anywhere (Mao, 2020). Since the rapid development of the Internet in 1998, China has successively issued several policies and regulations to promote the development of Internet education (Yi et al., 2017). In the “Ninth Five-Year Plan”, “Tenth Five-Year Plan” and “Eleventh Five-Year Plan” period, computer network facilities and digital libraries closely related to Internet education are vigorously developed (Yang & Liu, 2017).

China’s online education industry began to flourish in 2013, driven by capital, but compared with the European and American markets, it is still in its infancy, and social training institutions are relatively bold in innovation and experimentation (Mao, 2020). In 2014, the

“Zhongguancun Internet Education Innovation Center” was officially listed. It is a platform for the integration of the Internet education resources. The goal is to aggregate the Internet education industry and provide services for the industry. In 2017, China realised the scale of online education with the help of live broadcast and gradually matured. At present, the online education industry has formed various subdivisions, and the industry has shown a trend of refined development (Mao, 2020). Compared with traditional education, Internet + education can cross the dimensions of campus, region, country, etc., break the imbalance of resources and make the equal sharing of high-quality educational resources extremely convenient (Zhang, 2016). Secondly, Internet + education evaluation will also bring about many changes. Research at this stage shows that Internet plus education overcomes the difficulty of collecting and one-sided problems in traditional education evaluation (Bolliger & Wasilik, 2009). According to Yi et al. (2017), it can also collect emotional influences beyond test scores, expanding the connotation and function of educational evaluation. In recent years, the introduction of policies related to the Internet education has paved the way for its development and pointed out the direction and promoted the rapid development of China’s Internet education industry (Bao, 2020).

According to the big data of Baidu search, the search index of the keywords “online teaching” and “online education” increased from 300 on January 17, 2020, to nearly 5000 on February 10. The number of corporate users of Baidu’s online disk has increased in less than a month, ranking first in the education industry (Mao, 2020).

Advantages and Disadvantages of Online Learning

Students can watch replays repeatedly at any time while they study online. The students who cannot watch the live broadcast or take notes immediately or had difficulty understanding the lecture, can watch the live broadcast after class to deepen their understanding, which is impossible in ordinary classrooms (Guan, in press). Most platforms have online lecturers and time statistics, so teachers can easily understand the students’ class status and make targeted arrangements after class. In the orderly development of education and teaching activities, there are also many problems in detail. For teachers, online teaching resources for students must be prepared in advance while preparing lessons and ensuring sufficient resources during class (Mao, 2020). Some older teachers are not able to teach online and do not have

the conditions to study, which leads to the suspension of live broadcasts; some teachers lack experience in online live broadcasts and cannot handle some emergencies (Viner et al., 2020). Some students have poor self-awareness and self-control and do not listen to online lectures in time. Students are unsupervised, with live video streaming on their phones or computers but they are not watching (Ballantyne, 2003). Watching live online classes for a long time is also a test for students’ eyesight and energy. Individual students brush expressions and texts casually in class, which affects the normal class order (Viner et al., 2020). There are also some objective factors, such as some children’s home network resources are relatively poor and the hardware equipment is relatively poor, so they cannot watch the live broadcast normally. Online teaching network delay phenomenon is relatively serious (Mao, 2020). Online classes are less interactive, and some teachers reluctantly sing a one-man show, which greatly reduces the effectiveness of the class. Some problems in the classroom cannot be dealt with in time.

A Brief Introduction to a School in Ningxia

In 2018, the Ministry of Education approved the Ningxia Hui Autonomous Region as an “Internet + Education” demonstration area. In order to actively implement the construction of “Internet + Education” pilot colleges, a higher vocational college in Ningxia stood up and was the first to try. The school has invested heavily to update network hardware facilities, carry out IPV6 network transformation, establish online learning platforms, online learning courses, online learning guidance and support, online teaching management and quality assurance systems, laying a solid foundation for the Internet education. At the same time, through supporting the development of education informatisation in poverty-stricken areas and carrying out inter-provincial school pairing assistance to obtain high-quality teacher resources and coordinate its own teacher team, design teaching methods, activities and evaluations ensured that the Internet + curriculum construction achieves the expected results. In mid-to-late October 2021, the “new crown” epidemic struck Yinchuan. In the face of the complex epidemic prevention and control situation, the college actively responded to the epidemic prevention policy of the autonomous region, carried out closed management as soon as possible and carried out online teaching in a planned way, including online practical training. High-quality development is a touchstone to test the effectiveness of the college’s “Internet + education” construction. According to a third-party

evaluation agency's teaching satisfaction survey on the college's online teaching caused by the epidemic in early 2020, the proportion of students who are satisfied with teaching resources and teaching organizations exceeds 70%, and some reach more than 90%. The students have basically recognised the first online teaching of the college. However, from the perspective of individual data differences, the proportion of people who are particularly satisfied is not more than 50%, and the lowest is only about 25%. This highlights the construction of high-quality teaching resources, and there is still room for further improvement in the effectiveness of teaching organisations. It can be specific to a one-way indicator of platform acceptance. Only 25.94% of the students were fully satisfied with whether the existing functions of the online teaching platform could meet the student's learning needs. Only 21.04% of the students strongly agree with recognising good classroom order. 31.04% of the students have detailed arrangements for teaching tasks and other aspects that meet their learning needs. This highlights the main problems existing in online teaching. To sum up, the support of the online training platform is insufficient and the online teaching resources are insufficient; the online teaching training organisation is not standardised enough, and the real training experience is lacking.

Research Designs

Research Design Using EViews

Based on the teaching plan of "suspending classes without stopping" using the Econometrics Views (EViews) software and the Logit model, the changes in the grades of 1798 students have thoroughly demonstrated the impact of "Internet + education" on students' grades by a vocational college in Ningxia, China. In order to measure whether students can also obtain good teaching results in online learning during the epidemic. Its original intention is to "observe" the quantitative laws of society and activities using metrology methods and technologies. The core of the research is to design models, collect data, estimate models, test models and apply models (structural analysis, forecasting and policy evaluation). EViews is an indispensable tool for accomplishing the above tasks.

Logit Model Assumptions

According to Greene and Hensher's (2010) case of new teaching methods, a logistic regression analysis was conducted on the scores of students who received Internet + education. Because the limitation of linear

regression requires the dependent variable to be a quantitative variable, this paper studies the situation where the dependent variable is qualitative, so Logit regression analysis is used, which is the most widely used in sociology. The Logit model is a multiple regression model, assuming that the dependent variable y follows a two-point distribution. Combined with the Logit model's hypothesis, two factors affect the improvement of performance, namely, receiving Internet education, not receiving Internet education (PSI) and achievement test results (TUCE).

The formula is expressed as:

$$Y = C + \beta_1 X_1 + \beta_2 X_2$$

Can be deduced

$$\text{grade}^* = C + \beta_1 \times \text{tuce} + \beta_2 \times \text{psi}$$

Variable Settings

In this paper, the explained variable GRADE (Y) represents whether the grades improve after receiving Internet + education. If the grades are improved, the explained variable y takes the value of 1. Otherwise, the grades of higher vocational students are not improved, and the value is 0. The explanatory variable PSI represents whether the Internet + education has been accepted, where the acceptance value is 1 and the non-acceptance value is 0. There are other explanatory variable test scores for Internet + education to analyse the effect of this new method.

Data Sources

This article uses the data of the Academic Affairs Office of this university in Ningxia. 1788 students (both male and female) from 6 different majors in the same department in two grades were selected. They were divided into two groups in equal numbers. One group was trained by the Internet + education method, and the other was one grade higher. Therefore, they did not receive training, selected their academic performance of the same basic course and compared their performance with the thorough test. Considering the diversity of samples, the following assumptions are made.

Suppose:

- Assume that there is no difference in IQ among students.
- Assume that every student has done their best to complete the exam without any unexpected situation.

- c) Assume that major does not affect grades.
- d) Assume that gender does not affect performance.

The data obtained is as follows:

It can be seen from the results (**Table 1**) that among 1798 students, 1357 students have improved their test scores and 764 of them have received the new teaching method of Internet + education.

The results are brought into the model for analysis, and the following data are obtained.

Simplified analysis of the table.

The specific estimated expression can be obtained as follows

$$\text{grade}^* = -141.79 + 1.91 \times \text{TUCE} + 16.06 \times \text{PSI}$$

$$Z = (-8.08) \quad (8.1) \quad (7.85)$$

Table 1 Data summary

Sample serial number	TUCE	PSI	GRADE
1	94	0	1
2	92	0	1
3	92	0	1
4	92	0	1
5	93	0	1
6	90	0	1
7	90	0	1
8	90	0	1
9	92	0	1
10	91	0	1
11	91	0	1
12	91	0	1
13	93	0	1
14	98	0	1
.....			
1789	60	1	0
1790	60	1	0
1791	60	1	0
1792	60	1	0
1793	60	1	0
1794	60	1	0
1795	49	1	0
1796	50	1	0
1797	0	1	0
1798	37	1	0

From Table 3, it can be seen that the z-statistics of the explanatory variables participating in the Internet + education (PSI) and Test Score (TUCE) parameter estimates are relatively large. Its corresponding probability value *P* is small, obviously less than 0.05, indicating that these two variables are statistically significant. At the 5% confidence level, the effect of receiving the Internet + education is the most significant ($|16.06| > |1.09|$) and has a positive effect, that is, students who have received Internet + education have the highest probability of improving their performance, which shows that Internet + education positively impacts performance.

$Y = 1$ grades are improved, that is, the probability of being improved is $P(Y = 1) = P_1$

$Y = 0$ grades have not improved. The probability of not being improved is $P(Y = 0) = P_0 = 1 - P_1$

We can get

$$P(y = 1 | x) = \frac{\exp(x'\beta)}{1 + \exp(x'\beta)}$$

This is the relationship between probability *P* and independent variable *x*

Bring in the formula to get

Table 2 EViews results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-141.7852	17.54962	-8.079100	0.0000
TUCE	1.907092	0.235517	8.097477	0.0000
PSI	16.06358	2.046501	7.849291	0.0000
McFadden R-squared	0.929398	Mean dependent var	0.754727	
S.D. dependent var	0.430368	S.E. of regression	0.091148	
Akaike info criterion	0.081999	Sum squared resid	14.91288	
Schwarz criterion	0.091167	Log likelihood	-70.71753	
Hannan-Quinn criter.	0.085384	Deviance	141.4351	
Restr. deviance	2003.266	Restr. log likelihood	-1001.633	
LR statistic	1861.830	Avg. log likelihood	-0.039331	
Prob(LR statistic)	0.000000			
Obs with Dep=0	441	Total obs	1798	
Obs with Dep=1	1357			

Table 3 Simplified analysis

Variable	Coefficient	Z-test	P
TUCE test scores	1.09	8.1	0.00
PSI Whether to participate in the teaching of new methods	16.06	7.85	0.00

$$P(\text{grade} = 1 | \text{PSI}, \text{TUCE}) = \frac{\exp(C + \beta_1 \text{tuce} + \beta_2 \text{psi})}{1 + \exp(C + \beta_1 \text{tuce} + \beta_2 \text{psi})}$$

It can be seen from Table 2 that the LR statistic is relatively large (1861.83), and $LR \approx 1861.83 > X_{20.05}(2) = 5.99$, so at the given significance level $\alpha = 0.05$, the null hypothesis is rejected. This indicates that all selection coefficients in the selection model are not 0. And the corresponding probability P value is 0.000, indicating that the model is significant overall.

McFadden R-squared is similar to the coefficient of determination R^2 in the linear regression model. When the role of the explanatory variable is significant, the McFadden R-squared tends to 1. It is now known that the McFadden R-squared is approximately equal to 0.93, which means that the explanatory variables TUCE and PSI can explain 93% of the variation in performance improvement.

Factor Analysis

Data Sources and Analysis Tools

Through some investigations, the author selects 327 students who receive Internet education, selects their grades in 11 compulsory courses a year as variables and conducts statistical analysis (data appendix 1). The SPSS software, a highly reputable analysis software, used in this analysis can perform data management, statistical analysis, chart analysis, output management, etc.

Factor Analysis

Academic achievement is an important basis for measuring students' mastery of knowledge and skills, and is also an important reflection of teaching quality and teaching effect. The data collection and analysis become difficult because of the plethora of indicators that affect student achievement (K, 2017). In order to reduce the difficulty of data collection and analysis and make the measurement dimensions more rigorous and reasonable, the author needs to use the factor analysis method to reduce the dimension of many dimension indicators.

Factor analysis is a commonly used statistical analysis method. It is mainly based on the idea of dimensionality reduction by exploring the correlation coefficient matrix between variables and grouping variables according to their correlation (Leirhaug, 2015). This results in higher correlations between variables within the same group, lower correlations between variables in different groups and new variables representing the basic structure

of each group's data are common factors (K, 2017). That is to say, factor analysis is to aggregate intricately numerous variables into a few independent common factors without losing as much or as little original data information as possible (Leirhaug, 2015). These common factors can reflect the main information of the original many variables. While reducing the number of variables, also reflects the internal relationship between variables. Based on the test scores of 347 students who participated in the Internet education in higher vocational colleges in Ningxia, the author uses factor analysis to evaluate students' scores in various subjects comprehensively. Finally, the author hopes to discover the potential teaching rules or teaching problems behind the performance data.

Enter the data into SPSS, select dimensionality reduction factor analysis, select significance level, KMO and Bartlett's test of sphericity, and generate the results.

(1) Suitability test.

It can be seen from the KMO and Bartley's test table that the value of the KMO statistic is equal to $0.674 > 0.5$, indicating that it is barely suitable for factor analysis (Table 4). The Bartley test results show that Sig is less than 0.01, thus rejecting the null hypothesis that the

Table 4: KMO and Bartlett's test

KMO Sampling Suitability Quantity		.674
Bartlett's test of sphericity	Approx. chi-square	489.021
	Df	55
	Sig.	.000

Table 5 Communalities

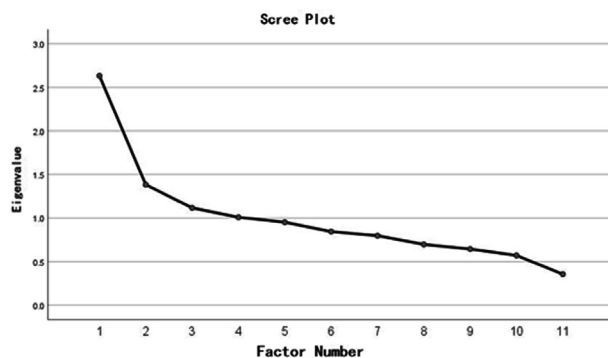
	Initial	Extraction
Financial regulations	1.000	0.675
College student psychology	1.000	0.318
Higher vocational English 1	1.000	0.534
Basic accounting skills	1.000	0.748
Basic accounting	1.000	0.490
Computer foundation 1	1.000	0.584
Military theory	1.000	0.591
Management training	1.000	0.522
Ideological and moral 1	1.000	0.354
Sports 1	1.000	0.601
Situation and policy 1	1.000	0.724

Extraction Method: Maximum likelihood.

Table 6 Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sum of Squares Loadings			Rotation Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	2.633	23.933	23.933	2.633	23.933	23.933	2.320	21.089	21.089
2	1.382	12.568	36.501	1.382	12.568	36.501	1.504	13.668	34.757
3	1.116	10.150	46.650	1.116	10.150	46.650	1.163	10.576	45.333
4	1.009	9.169	55.819	1.009	9.169	55.819	1.153	10.486	55.819
5	0.952	8.651	64.470						
6	0.844	7.674	72.144						
7	0.797	7.247	79.391						
8	0.697	6.339	85.730						
9	0.644	5.855	91.586						
10	0.570	5.184	96.770						
11	0.355	3.230	100.000						

Extraction Method: Maximum likelihood.

**Chart 1**

correlation matrix is a unit matrix; that is, it is considered that there is a significant correlation between the course variables, which is suitable for factor analysis.

(2) Selection and interpretation of common factors.

Common factor variance. The extraction of the variance of the initial variable by the common factor is given. Most of the variance extraction in this example is about 50%. It can be seen that the interpretation effect of the common factor on the variance of the variable is barely acceptable (Table 5).

It can be seen from the variance interpretation table and gravel diagram that the first four eigenvalues are relatively large, and the rest are relatively small. The eigenvalues of the common factors are all greater than 1, and the cumulative variance explained reaches 55.819%. That is to say, these four common factors can explain nearly 50% of the overall information. In this example, the first four common factors are taken for analysis.

Table 7 Factor matrix^a

	Factor			
	1	2	3	4
Financial regulations	0.759	-0.161	0.159	-0.219
College student psychology	0.490	0.092	-0.060	0.256
Higher vocational English 1	0.608	0.248	0.002	-0.321
Basic accounting skills	0.211	0.355	-0.420	0.633
Basic accounting	0.604	0.010	-0.351	-0.043
Computer foundation 1	0.652	0.319	0.006	-0.239
Military theory	0.413	-0.466	0.202	0.404
Management training	-0.014	0.439	0.447	0.359
Ideological and moral 1	0.578	0.074	0.008	0.117
Sports1	0.131	0.201	0.735	0.063
Situation and policy 1	-0.301	0.777	-0.089	-0.152

Extraction Method: Maximum likelihood.

4 factors extracted.

The following table gives the component matrix of the four principal components, also known as factor loadings, which essentially refers to the correlation coefficients between the principal components and the original variables. The linear combination of the original indicator variables can be obtained through the factor loading matrix.

The above table (Table 7) is the rotated factor loading matrix, which calculates the performance of the sample on a single factor through the factor score expression. Taking the factor score result as the approximate value of the substitute indicator and the ratio of the factor variance contribution rate and the cumulative variance contribution rate as the weight of the substitute

Table 8 Rotated factor matrix^a

	Factor			
	1	2	3	4
Financial regulations	0.717	0.379	-0.126	0.028
College student psychology	0.362	0.202	0.373	0.080
Higher vocational English 1	0.725	-0.084	-0.025	0.026
Basic accounting skills	0.041	-0.058	0.862	-0.015
Basic accounting	0.563	0.129	0.269	-0.290
Computer foundation 1	0.750	-0.092	0.073	0.085
Military theory	0.095	0.738	0.155	0.116
Management training	-0.049	-0.114	0.229	0.674
Ideological and moral 1	0.489	0.213	0.247	0.092
Sports 1	0.130	0.087	-0.185	0.737
Situation and policy 1	-0.017	-0.820	0.126	0.188

Extraction Method: Maximum likelihood

Rotation Method: Varimax with Kaiser Normalisation

a. Rotation converged in five iteration

Table 9 Factor transformation matrix

	Factor			
	1	2	3	4
Financial regulations	0.309	0.156	-0.209	0.017
College student psychology	0.086	0.104	0.290	0.065
Higher vocational English 1	0.371	-0.175	-0.134	-0.014
Basic accounting skills	-0.099	-0.022	0.773	-0.024
Basic accounting	0.228	-0.007	0.165	-0.272
Computer foundation 1	0.368	-0.178	-0.050	0.036
Military theory	-0.099	0.528	0.149	0.142
Management training	-0.069	-0.026	0.207	0.583
Ideological and moral 1	0.165	0.089	0.157	0.071
Sports1	0.045	0.082	-0.188	0.645
Situation and policy 1	0.095	-0.572	0.090	0.114

Extraction Method: Maximum likelihood.

Rotation Method: Varimax with Kaiser Normalisation.

indicator, the comprehensive score of each sample can be calculated as the basis for evaluating the students' comprehensive performance.

Therefore, it can be seen from Table 8 that in the first factor variable, financial regulations, higher vocational English 1, basic accounting, computer foundation 1, ideological and moral cultivation and legal foundation 1 all have larger loads. It reflects the professional mathematics ability quality and ability level of students to solve practical problems, so it is defined as the ability factor to solve practical problems. The second military theory course is the basic theory course for higher vocational students, which can be defined as the educational quality factor. The third factor variable has a large load on college students' psychology and basic accounting skills, which can be a professional basic theoretical factor. The fourth factor variable defines the ability of enterprises to solve problems in reality by simulating sand table training, sports 1, situation and policy 1.

Table 9 is the component score coefficient matrix. For each factor, multiply the coefficient by the corresponding course name and then sum it up to get the final factor score formula, which can be used to score all cases.

Therefore:

The scoring formula for factor 1 is:

$F1 = 0.309 * \text{financial regulations} + 0.086 * \text{college student psychology} + 0.371 * \text{higher vocational English 1} - 0.099 * \text{basic accounting skills} + 0.228 * \text{basic accounting} + 0.368$

$* \text{computer foundation 1} - 0.099 * \text{military theory} - 0.069 * \text{management training} + 0.165 * \text{Ideological and moral 1} + 0.045 * \text{Sports} + 0.095 * \text{Situation and policy 1}$

(3) Comprehensive evaluation.

The factor score function is calculated using the factor score coefficient matrix, and the student's scores in each common factor are obtained. On this basis, the variance contribution rate of each common factor is used as a weight, and a linear combination is used to establish a comprehensive student achievement model (Table 6), whose model is as follows:

$$F = 0.2109 * F1 + 0.1367 * F2 + 0.1058 * F3 + 0.1049 * F4$$

The comprehensive score ranking of students can be obtained from the model, see Appendix. For example, some students rank high but have obvious disadvantages in the first factor. Teachers need to pay special attention to their professional grades. It can be seen that factor analysis has unique advantages, which can find students' personality characteristics and comprehensive ability, to teach students in accordance with their aptitude better and improve the quality of teaching. This is incomparable to the overall score ranking, and the evaluation results are more objective.

Discussion of the results

Through the Logit model, it is assumed that two factors affect the improvement of performance, that

is, receiving Internet education, not receiving Internet education (PSI) and achievement test results (TUCE). The z-statistics of Internet + education (PSI) and test scores (TUCE) parameter estimates are relatively large, and the corresponding probability value *P* is small, indicating that these two variables are statistically significant. At the 5% confidence level, the effect of receiving Internet education is the most significant and positive. This shows that students who have received Internet + education have the highest probability of improving their performance, which shows that Internet + education has a good and positive impact on performance. The explanatory variables TUCE and PSI can explain 93% of the variation in performance improvement.

The comprehensive scores of vocational students play a great role in evaluating the quality of teaching, and the scores have a very important reference value for testing the quality of courses and measuring the rationality of talent training. At present, the scores of vocational students are generally ranked directly according to the total score of each subject. This method is simple and easy to implement, intuitive and easy to understand, and easy to operate. However, it is too one-sided and general and has obvious shortcomings. It cannot reflect the strengths and personality differences of all students and cannot see the practical ability of students. Therefore, this evaluation method has certain disadvantages.

The author provides another method for evaluating students' achievement—factor analysis. This method makes up for the above shortcomings. Starting from the internal structure of the data, by analysing the results, we can find out the factors that affect the student's grades and explain the factors that affect their grades more objectively and scientifically, which allows teachers to better teach and cultivate students on a daily basis.

Conclusions

If education is prosperous, the country will be prosperous, and if education is strong, the country will be strong. A higher vocational college in Ningxia, China, has become the first Internet + education pilot college in China and is expected to complete the 2018–2022 demonstration zone construction plan. Through the development of Internet + education, students in poverty-stricken areas can obtain good educational resources and cultivate more talents for the future talent market. This paper uses the Logit binary regression model as a framework and is based on the actual performance of 1798 students as

microdata to measure the impact of the new education model of "Internet + education" on student performance.

Prospects and Advantages of Online Teaching Development

The epidemic will eventually pass, and traditional education cannot fully return to what it was before the new crown epidemic. The trend of the Internet information technology participating in education and teaching is unstoppable. Many schools have used the advantages of information technology to carry out various activities online, hold online academic lectures, open teaching resources for free and promote sharing high-quality resources. This series of measures has greatly broken through the limitations of time, space, location, identity, etc. It delivers high-quality teachers, excellent educational concepts, advanced educational ideas and interesting classrooms to the world, so the world sharing of high-quality resources has gradually changed from an idea to a reality. What follows is a major change in teaching mode, teaching environment, educational resources, evaluation and feedback methods, etc. The integration, innovation and development of the Internet information technology and education and teaching will be an inevitable trend.

Actions and Challenges for Online Teaching Development

One of the six major trends in global education reform is that "confidence in traditional education systems is being shaken". That is to say, traditional education does not provide more help for learners. Even without formal education and educational experience, it does not prevent learners from finding jobs and starting to choose other study paths besides higher education. As a young teacher, how to effectively ensure the quality of online teaching? This is the challenge each educators faces. I have come up with the following measures for your consideration:

- a) Improve teachers' teaching design level. Good instructional design is the foundation of course quality. To do a good job in instructional design, the most important thing is to study, that is, to carry out a learner-centred instructional design based on "how people learn", rather than based on "what technology can do". Instructional design should start with "why to learn" and determine students' learning

needs and learning goals; According to the learning objectives, it is further determined which specific teaching contents are used to improve students' knowledge and skills, processes and methods and emotional attitudes and values, to meet the needs of students, that is, to determine "what to learn" and to teach more accurately. The design of online courses in American colleges and universities is worthy of our reference. The development of online teaching resources in American colleges and universities, especially with a large number of online education students, requires teachers to cooperate with instructional designers rather than develop courses independently. Research shows that when a group develops a curriculum or when teachers and instructional designers collaborate to develop a curriculum, learners have richer learning activities and more effective learning.

- b) Stimulate students' learning initiative. Interest is the best teacher. When learners have beliefs, ideas and ideals, they will know why they are learning, which can greatly stimulate students to change from passive learning to active learning. Teachers can stimulate students' interest through a series of competitions, awards, etc. Of course, teachers can also help students develop independent study habits through various methods such as after-school tutoring, homework feedback, rewriting comments on homework, exchanging more experiences with students and guiding online teaching methods. Self-disciplined living habits can help students to improve their learning efficiency. Teachers can use different teaching modes to design more activities for students to participate in the classroom and make students move. Teachers can also teach students in accordance with their aptitude based on the needs of students' independent learning, so that students can better adapt to online teaching and return the classroom to students.

In the Internet-based smart education environment, online classes, flipped classrooms, and modular teaching meets students' individual learning needs and truly teach students according to their aptitude, effectively improving the quality of teaching. However, as a national strategy, "Internet + education" is still in its initial stage. This environment teaches how to effectively integrate various educational models and conduct educational modules perfectly. Even a series of problems, such as random capture of assessment questions, intelligent correction of homework and scientific evaluation of

courses, need to be constantly explored and solved in practice.

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Declaration of Conflicting Interests

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