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# *Analysis of Teaching Practice of Engineering Cost Professional Courses under the Background of Intelligent Big Data*

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***Abstract:*** In recent years, with the rapid development of the building decoration engineering industry, the demand for talents' knowledge, concepts and skills is also increasing. The major of engineering cost should follow the progress of the times, constantly explore and reform the teaching mode, and cultivate students' comprehensive quality and practical ability. However, compared with other disciplines, construction engineering has higher practicality, so the problem that should be paid attention to in practical operation is how to carry out effective practice. In the intelligent big data environment, by combining modern information technology with traditional teaching methods, and combining the characteristics of disciplines to carry out practical classrooms, it can effectively solve the shortcomings of traditional classroom teaching that emphasizes practice and theory. This paper mainly discussed how to carry out the teaching practice of engineering cost under the environment of "intelligent big data". Through the cloud model-grey correlation analysis, a new teaching quality evaluation mode was established. By calculating the weight of each index, it effectively overcomes the shortcomings of traditional evaluation methods such as strong subjectivity and complicated calculation. The experimental results of this paper show that 53 students think that the curriculum is more theoretical, accounting for 27.9%, and 47 students think that the curriculum is not enough, accounting for 24.7%. There are 42 students who think that the self-study time is less, accounting for 22.1%.

## 1. Introduction

In the basic education system, teachers play an auxiliary role, and his function is to provide appropriate auxiliary education for students' basic operation skills. On the basis of basic teaching, because the basic orientation of practical teaching is not clear, there are still many defects in cultivating students' hands-on ability and creative ability, for example, talents have a tendency to overlook practice in favor of theory in training. Engineering cost is a practical profession, and

improving students' overall quality is the primary objective of practical teaching. To address the needs of society for skills, which is also the direction in which education would evolve in the future, theory and practice must be blended. In order for the practical teaching technique to effectively serve its purpose, it must be revised.

Nowadays, the development of high technology benefits every sector of the economy. It is suggested to encourage the use of modern intelligent big data technology in the sphere of education in China's long-term education reform and development strategy. Accelerating the digitization of instruction has been the main focus of endeavor. The long-term advancement of the economy, science, and society depends in large part on the application of intelligent big data technologies in education. A crucial approach for all nations, particularly industrialized nations, is to hasten the modernization and informationalization of China's educational system and to execute the unification of theory and practice as soon as feasible. The development of education informatization has reached a new stage as a result of national strategy and educational endeavors. The creation of teaching materials in colleges and universities has drawn increasing attention from educators as a result of the big data revolution and the growing popularity of education IT. The innovation of this paper is to study the teaching practice of engineering cost professional courses under the background of intelligent big data, and propose the feasibility of cloud model-grey correlation analysis for teaching and practice in intelligent environment.

## 2. Related Work

The teaching of engineering cost courses in prestigious colleges and universities continues to face significant challenges, and practical instruction is a crucial component of the overall educational process. The growing demand for buildings, which prompted the establishment of an engineering cost major, was discovered by Razani M in the classroom instruction of architecture. Considering the diversity of architectural decoration, the practicality of teaching should attract people's attention [1]. College students are the leaders and driving forces of the future development of the construction industry, but although teaching practices have been implemented in various colleges and universities. As suggested by Ruoyu J, there was not enough research to provide students' perspectives on practice and its application in the learning process [2]. Arens found that teaching practice has begun to appear in traditional disciplines related to engineering cost. As educators, teachers have a responsibility to ensure that students' curriculum reflects innovation in practice, that is, considering ways to improve practice, rather than continually learning theory [3]. Brohi I A believed that training and hands-on experience were essential to enable college students to participate more effectively in the design and construction of projects when they are employed. He has studied a large amount of teaching in the field of architectural education, while focusing on practice and educational methods in the field [4]. According to experts, the demand for architects has been increasing in recent years. However, the traditional methods of teaching engineering cost have fallen behind the demands of students.

People started studying the teaching mode against the backdrop of intelligent big data in order to address the issue of challenging practice in engineering cost. Based on the finding of Bai X, educators created an intelligent big data statistical analysis platform, and he carried out effective practical teaching for architectural decoration engineering [5]. The goal of the Tvedebrink T study was to examine how an innovative course called Architectural Decoration Engineering helps students acquire knowledge and assess relevant skills. This required architectural education to reassess practical teaching in order to bridge the gap between theory and practice. He recommended using large amounts of intelligent data to practice and guide students [6]. Wang J found that the intelligent big data platform for online teaching can subdivide the functional modules of the system

according to the needs of users. Online experiments, online classes, video courses, online assessments and basic functional modules are the basic functional modules of the system. It can meet the important practical needs of architectural decoration engineering students to learn architectural decoration [7]. According to the discussion of the above researchers, big data is one of the important technologies in the digital age. Today's world is a rapidly developing society. Due to the rapid development of science and technology, the dissemination of knowledge is particularly fast and convenient, which also makes the education and practice of engineering cost easier and more practical.

## 3. Evaluation of Teaching Practice Based on Cloud Model-Grey Correlation Based on Intelligent Big Data Background

With the acceleration of urbanization, a large number of residential construction would appear, and the demand for industries, energy bases, and transportation facilities would continue to grow. At present, China has entered an aging society. The academic qualifications of construction technicians are relatively low, and most of them are migrant workers, so it is difficult to adapt to the new situation of the development of the construction industry [8]. Strengthening the technical and professional staff's training in engineering cost is required to achieve this goal. It seeks to develop talents with a focus on development and a range of skills in order to prepare them for the demands of the socialist market economy. The content of engineering cost teaching is shown in Figure 1:

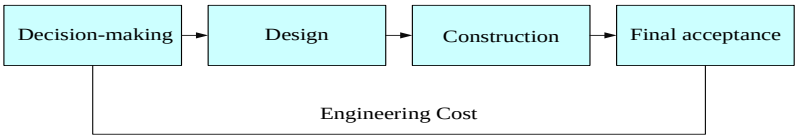



Figure 1. Contents included in the teaching of engineering cost

As shown in Figure 1: Engineering cost major refers to the professional skills of design, cost, material selection, construction, management, and testing of interior and exterior decoration projects of buildings. Project Costs (PC) refers to the construction expenses that are expected or actually incurred during the construction period of a project.

In the practical teaching of engineering cost, it is mainly combined with theoretical teaching. Teachers have a comprehensive grasp of theoretical knowledge, but they lack of real-world experience prevents students from achieving the best outcomes in real-world situations [9]. The tiny size of the school makes it challenging for pupils to apply a lot of knowledge in real-world situations, which leads to subpar classroom instruction. Additionally, some students are not really enthusiastic about practical, and only pay attention to observation and imagination in practical operation, with little practical operation. Under such a background, it is difficult for students to improve their practical ability, and their understanding of theoretical knowledge is only superficial, which has a negative impact on future learning and development [10].

### 3.1 Micro-lecture Teaching Practice Based on Intelligent Big Data

Micro-lectures are renewable and sustainable teaching resources. Engineering cost is a high-level specialty, and its theoretical knowledge is relatively complex and abstract, which often leads to low learning efficiency in architectural design and drawing courses [11]. Therefore, teachers can use micro-lectures as a renewable teaching resource in engineering cost courses to provide students with professional teaching content, so as to achieve teaching purposes. Intelligent big data teaching is shown in Figure 2.

As shown in Figure 2: With the popularization of modern information, China already has a large

number of smart phone terminals. In this case, students can conduct mobile learning through mobile phones without being restricted by geographical reasons. Because of its unique advantages, micro-courses are quickly popularized in schools [12].

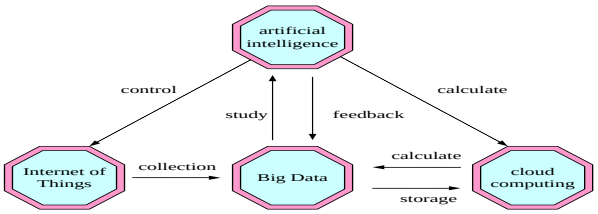



Figure 2. Intelligent big data teaching

In architectural design, micro-lectures can be simulated and drawn, so teachers cannot rely solely on theoretical knowledge when imparting knowledge, but improve students' practical ability through practical operations. In traditional teaching, teachers have to impart a lot of knowledge to students in limited teaching time, which greatly limits students' practical operation in teaching. Micro-lectures can solve this problem very well.

The micro-lecture teaching mode can not only show the scattered knowledge points to the students, but also compress the time of the course to a short time. It makes students always interested in learning, so that students can easily learn at any time and anywhere. The micro-lecture teaching mode is shown in Figure 3:

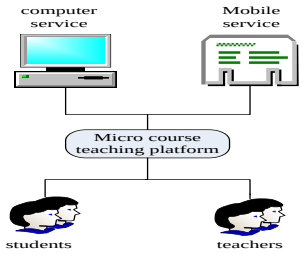



Figure 3. Micro-lecture teaching mode

As shown in Figure 3: In the course of engineering cost, teachers can only actively mobilize students' interest in learning through the proper use of micro-course learning resources. Given the high popularity of modern information technology, micro-lectures not only help students learn in the classroom, but also help them learn in their leisure time. It can also enable students to obtain knowledge points at any time and any place, greatly reducing the teaching burden of teachers, enabling students to develop their own initiative, thereby improving the quality of teaching.

In the traditional teaching method, most of the teaching content and knowledge points are completed according to the syllabus. The content taught by the teacher in the classroom is also relatively complex. Different from the traditional teaching method, each class of the micro-lecture has only one knowledge point, and it is also accompanied by a large number of practical operations. For example, when explaining the section of a building, the teacher can decompose the section problem into a lesson, and let the students go from part to part to cross section. In this way, students can discover and solve problems in time while watching, and continuously improve their abilities.

### 3.2 Evaluation of Engineering Cost Teaching Practice Based on Grey Relational Analysis

At present, China's intelligent education is developing rapidly, but an evaluation standard has not been established to ensure the quality of intelligent teaching. Some scholars have also made some useful explorations, but a unified and systematic evaluation index system has not yet been formed. Therefore, the research on the quality of intelligent education is not deep enough.

The purpose of this paper is to use the grey relational analysis method to study the above problems. Since many evaluation methods have been formed in the development process of educational evaluation, they can be classified into qualitative evaluation and quantitative evaluation. These evaluation methods have their own characteristics and scope of application. Therefore, the appropriate evaluation method should be selected according to the evaluation object and actual needs.

Gray relational analysis is a gray system based on fuzzy information. Its main features are simple structure, small amount of calculation, and do not need to consider the distribution of data, so it has a wide range of applications. Using gray correlation to evaluate the quality of intelligent education can help overcome the challenges of excessive data volumes.

If there are m index factors and n assessment participants, the obtained raw data sequence is recorded using formula (1):

$$A=\left(a_{ij}\right)_{n\times m}=\begin{bmatrix} a_{11} & a_{12} & ... & a_{1m} \\ a_{21} & a_{22} & ... & a_{2m} \\ ... & ... & ... & ... \\ a_{n1} & a_{n2} & ... & a_{nm} \end{bmatrix},\left(i=1,2...,n,\ j=1,2,...,m\right) \tag{1}$$

The normalized matrix is A, and then write the formula (2) of the normalized matrix:

$$A^{'}=\left(a_{ij}^{'}\right)_{n\times m} \tag{2}$$

In addition, the evaluation set $A=a_1,a_2,...,a_m$ refers to whether the evaluation standard is subdivided into multiple levels, and the m index factor scores of n evaluation objects are obtained by first averaging the original data sequence by column. This value is represented by formula (3):

$$\bar{A}=\bar{a}_j=\left[\bar{a}_1,\bar{a}_2,...\bar{a}_m\right],\left(j=1,2,...,m\right) \tag{3}$$

The associated data matrix is then obtained by quantifying each evaluation level in the evaluation set L, where each quantized value corresponds to m index factors, as shown in formula (4):

$$L=\left(l_{kj}\right)_{n\times m}=\begin{bmatrix} l_{11} & l_{12} & ... & l_{1m} \\ l_{21} & l_{22} & ... & l_{2m} \\ ... & ... & ... & ... \\ l_{p1} & l_{p2} & ... & l_{pm} \end{bmatrix},\left(k=1,2...,\ p,\ j=1,2,...,m\right) \tag{4}$$

The comparison sequence is represented by this data matrix $l_{kj}$, if the correlation of the comparison data column is high, each element that needs to be evaluated is the closest to the comparison sequence.

This study integrates cloud model with grey relational analysis to produce exact numerical values and qualitative data. Cloud generator is utilized to achieve mutual conversion between qualitative and quantitative data. Formula (5) produces a normal random number with expected value $En$ and variance $He$:

$$En_i^{'}=NORM\left(En,He^2\right) \tag{5}$$

Formula (6) creates a normal random number with a new expected value $Ea$ and a new

variance $Hn_i^{'}$:

$$Ea_i = NORM\left(Ea, Hn_i^{'2}\right) \tag{6}$$

The cloud model for each tier one indicator is created by applying complete cloud technology. Considering the cloud model of each secondary indicator and its corresponding weight, it is divided into q secondary indicators, and the corresponding cloud model is formula (7):

$$C_q = \left(Ea_q, En_q, Ee_q\right) \tag{7}$$

The cloud model of the first-level index is a comprehensive cloud model generated by the matching weights of the q-item second-level index cloud models.

The average correlation coefficient was used to calculate the correlation, but the results were wrong because the method partially ignored the contribution of each indicator to the overall rating. Therefore, the correlation degree is calculated in this paper, and the number of correlation degree is expressed as the sum of the products of the correlation coefficients of each index and its corresponding weight, as shown in formula (8):

$$\gamma_i = \sum_{j=1}^{m} \xi_{ij} \times w_i \tag{8}$$

$\gamma_i$ fully considers the weight difference between each index $w_i$, which improves the objectivity and accuracy of the research. The closer the level of the indicator $\xi_{ij}$ to be analyzed is to the known level, the higher the grey correlation degree.

Formula (9) is used to determine the highest value of the correlation degree:

$$r_t = \max\left\{r_i\right\} \tag{9}$$

The teaching evaluation model based on cloud model-grey relational analysis presented in this research is used to assess the efficacy of classroom instruction. The final teaching quality evaluation grade is the teaching evaluation grade corresponding to the highest degree of relevance $r_t$. Figure 4 illustrates the correlation between the teaching quality of engineering cost and the teaching evaluation grade.

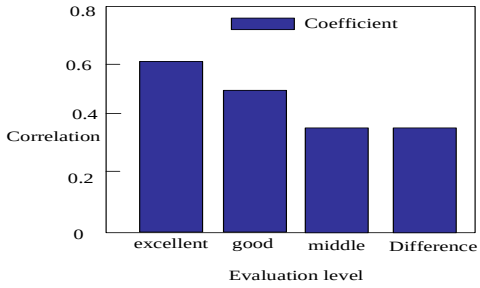


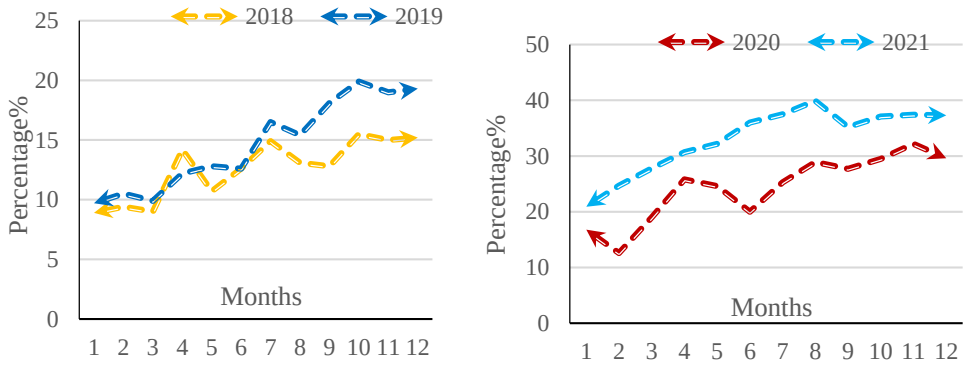

Figure 4. The correlation between the teaching quality of engineering cost and the teaching evaluation grade

As seen in Figure 4, "Excellent" has the strongest correlation in the course evaluation, suggesting that using the method described in this research to assess teaching quality can produce more accurate evaluation findings. In order to increase the objectivity and rationality of the teaching quality due to the haziness and uncertainty of its influencing elements, the grey relational degree theory is used to thoroughly evaluate the teaching quality. The constant topic of instructional work is raising the quality of instruction.

## 4. Investigation of Problems and Countermeasures in Teaching and Practice of Engineering Cost

This paper takes 190 students and 190 teachers of engineering cost major in a university as the object of investigation.

Construction industry is an important industry. At present, China's construction industry has formed a large-scale industry, but the low level of industrial organization, low technical level, and low quality of employees are important factors that restrict the rapid and healthy development of the construction industry, as shown in Figure 5:




(a) Growth trend of construction industry in 2018-2019 (b) Growth trend of construction industry in 2020-2021

Figure 5. Growth trends in the construction industry 2018-2021

As shown in Figure 5: (a) it can be found that the growth trend of the construction industry has been rising in 2018-2019. In (b), it can be found that the growth trend of the construction industry from 2020 to 2021 is also rising. It can be seen that building decoration engineering technology has been welcomed by more and more people.

The demand for talents in engineering cost is diversified and multi-level. As a engineering cost student, we must not only have technology but also have creative thinking. So, we should go out of the classroom, go deep into the enterprise, conduct in-depth communication with the company, go deep into the construction site, the home furnishing market and the model house to learn and understand the common styles in the market. Through the combination of theory and practice, it is very necessary to broaden horizons and expand ideas.

### 4.1 Investigation of Intelligent Environment for Teaching Practice

The basic condition for the combination of intelligent big data technology and classroom teaching is the infrastructure of intelligent big data carrier and transmission, and its rationality and effectiveness would directly affect the implementation of educational informatization. In this context, good software and hardware facilities can create diverse learning environments for teachers and students, and provide strong support for cooperative learning and inquiry learning.

This paper surveys 190 students whether the school has sufficient hardware and software facilities, as shown in Table 1.

As shown in Table 1: A survey of 190 students who thought the school had sufficient hardware and software facilities found that 25 students thought that the school had very sufficient hardware and software facilities, accounting for 13.2%. 31 students believed that the school had adequate hardware and software facilities, accounting for 16.3%, and 46 students believed that the school had generally sufficient hardware and software facilities, accounting for 24.2%. 43 students believed that the school did not have sufficient hardware and software facilities, accounting for 22.6%, and

45 students believed that the school's software and hardware facilities were very insufficient, accounting for 23.7%. It can be seen that the hardware and software facilities of the school still need to be improved. Inadequate facilities can have a significant negative impact on teaching activities without adequate effective training and thorough facility troubleshooting mechanisms. Architecture teachers may occasionally use some professional tools, such as geometric sketchpads and simulation labs, which may be unfamiliar to students.

Table 1. Whether the school has sufficient hardware and software facilities

| Adequacy | number of people | percentage |
|---|---|---|
| very adequate | 25 | 13.2% |
| relatively sufficient | 31 | 16.3% |
| generally sufficient | 46 | 24.2% |
| Insufficient | 43 | 22.6% |
| very insufficient | 45 | 23.7% |

## 4.2 Investigation of Basic Problems in Practical Teaching

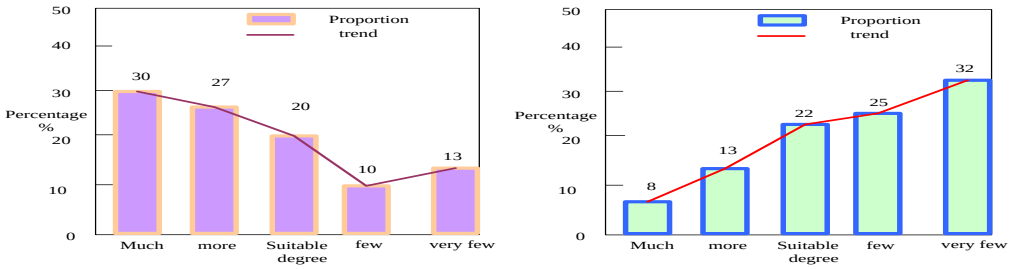
The construction industry's technology is continually evolving, and new materials are constantly appearing, but the content of teaching materials in colleges and universities has not been updated, and the teaching content has been out of step with current development requirements. Therefore, what students learn in the classroom are some outdated construction techniques, which cannot be matched with new technologies and new materials, so they have to learn new knowledge after employment, but cannot apply school knowledge into practice. The views of the 190 students on the courses offered by their majors are shown in Table 2:

Table 2. 190 students' views on the courses offered by their majors

| views | number of people | |
|---|---|---|
| Theoretical | 53 | 27.9% |
| The curriculum is not broad enough | 47 | 24.7% |
| Less time for independent study | 42 | 22.1% |
| Suitable for talent training | 12 | 6.3% |
| boring content | 36 | 19.0% |

As shown in Table 2: There are 53 people who think that the courses offered by their majors are more theoretical, accounting for 27.9%. There are 47 people who think that the courses offered by their majors are not wide enough, accounting for 24.7%. There are 42 people who think that the courses offered by their majors have less independent study time, accounting for 22.1%, and 12 people who think that the courses offered by their majors are suitable for talent training, accounting for 6.3%. There are 36 people who think that the content of courses offered by their majors is boring, accounting for 19.0%. It can be found that the problem is that the curriculum setting is unreasonable, and it may be that the theoretical courses are not used in practice, which requires continuous analysis and discussion in future teaching.

Although students also participate in practice in practice teaching, it is a negative attitude in essence, which leads to the decline of students' enthusiasm for practice. It does not pay enough attention to the basic practice courses, and the enthusiasm and learning situation of learning also have great problems. In this practical teaching mode, students' practical skills are taught as the basic form of knowledge. It seriously weakens the creativity of students, thus affecting the overall development of students. The survey on the number of professional theoretical courses and practical courses that students think in the existing curriculum is shown in Figure 6.




(a) Students think the number of professional theory courses in the existing curriculum
(b) Students think the number of professional practice courses in the existing curriculum

Figure 6. Survey on the number and extent of students' opinion of professional theoretical courses and practical courses in the existing curriculum

As shown in Figure 6: (a) shows that the percentage of students who think that the number of professional theories in the existing curriculum is very large is 30%. 27% think that the theoretical quantity is relatively large, and 20% think that the theoretical quantity is appropriate. The percentage that thinks the number of theories is small is 10%, and the percentage that thinks that the number of theories is very small is 13%. It can be seen that in the teaching of engineering cost, theoretical teaching is relatively common.

(b) shows that the percentage of students who believe that the number of professional practice courses in the existing curriculum is very large is 8%, and the percentage that the number of theoretical courses is relatively large is 13%. The percentage that considered the theoretical quantity appropriate was 22%, the percentage that the theoretical quantity was low was 25%, and the percentage that the theoretical quantity was very small was 32%. It is clear that the training of engineering cost lacks practical instruction.

We must maintain a balance between theory and practice, avoid placing too much emphasis on theory, and pay attention to the development of both theory and practice. This can effectively enhance students' hands-on ability and creativity, and improve their technological innovation ability.

### 4.3 Attitudes of Students and Teachers Towards Intelligent Big Data

As a result, teaching revolves around the pupils. As the bulk of educational activities, students' learning attitude often has a certain impact on the quality of the whole teaching process. Students' attitudes towards intelligent big data are shown in Figure 7.

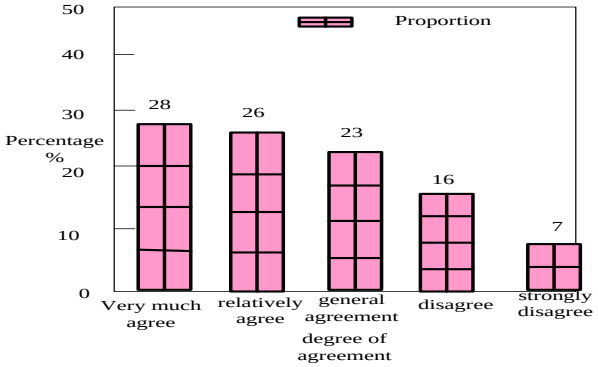



Figure 7. Students' attitudes towards intelligent big data

As shown in Figure 7: 28% of students fully agree to apply intelligent big data to teaching practice. Only when students show a positive attitude towards intelligent big data would they actively use this information to support their own learning, and students' subjective attitudes would

also affect their control and adaptation to intelligent classrooms. Under the background of intelligent big data, students can not only achieve better results, but also directly strengthen their determination to use intelligent tools to learn. At the same time, students' learning behavior would also affect teachers' teaching behavior to some extent.

People today are under enormous pressure. The profession of a teacher is noble in the eyes of others, but teachers shoulder the heavy trust of the government, schools, parents and students, and their pressure is unimaginable to ordinary people. Teachers not only have to complete daily teaching tasks, but also participate in various teaching and scientific research. Although there are only a few classes a day, the workload is very large. If teachers' study and research are not effectively guaranteed, their research would be greatly affected.

The experiment investigates whether 190 teachers think they have enough time to conduct research on classroom teaching under intelligent big data to understand whether teachers have enough energy, as shown in Table 3.

Table 3. Whether teachers have enough time

| degree of time | number of people | percentage |
|---|---|---|
| a lot of time | 16 | 8.4% |
| more time | 21 | 11.1% |
| Usually more time | 30 | 15.8% |
| not much time | 57 | 30.0% |
| very little time | 66 | 34.7% |

As shown in Table 3: 16 teachers believe that they have a lot of time to conduct research on classroom teaching under intelligent big data, accounting for 8.4%. There are 21 teachers who think they have more time to do research, accounting for 11.1%. There are 30 teachers who think they have more time to do research, accounting for 15.8%, and 57 teachers who think they have less time to do research, accounting for 30.0%. There are 66 teachers who think they have very little time for research, accounting for 34.7%. Teachers' present energy levels are very low, and it is clear that they do not have enough time to study classroom instruction in the context of intelligent big data.

### 4.4 Teaching Mode Strategy of Engineering Cost Major under Background of Intelligent Big Data

(1) Timely update teaching content in light of the actual development of the industry

Some teaching materials in engineering cost major are outdated, the information and materials are not updated in time, and the students' study time is relatively long, and what they have learned after graduation would become useless. What they learn in school does not match the knowledge at work and cannot really be used. As a result, it's critical to fully utilize the most recent big data technologies, gather the most recent information quickly, and include it in textbooks to guarantee that pupils are taught the most recent information. The original theoretical knowledge courses are compressed to a certain extent, and practical courses such as construction technology, building material information, and architectural popular styles are added, or some architectural professional knowledge urgently needed by the society is provided according to students' interests and occupational needs. Teachers should stay up with the times and continuously update their educational concepts and teaching methods, not merely sticking to the conventional methods, given the rapid advancement of science and technology and the ongoing updating of knowledge. Teachers should change from teachers speaking and students listening to teachers and students discussing and cooperating together, and turning teachers into part of collective learning. It can not only promote the harmonious development of teachers and students, but also enhance students' enthusiasm for

learning.

(2) Increase capital investment to create an excellent academic environment combining theory and practice

On the basis of the existing digital teaching resource sharing platform, the existing intelligent teaching resources such as courseware, online courses and examination questions are uploaded to the platform, and corresponding intelligent teaching resources are developed according to the individual needs of students.

Due to the lack of funds, the teaching of construction engineering in many colleges is often carried out in the traditional teaching form, and does not combine theoretical knowledge with practice. Therefore, it is necessary to strengthen the capital investment in teaching practice, on the one hand, it can attract outstanding talents with a certain professional background. On the other hand, the practical problems of students are solved through practice equipment, so that they can transform the theoretical knowledge they have learned into the ability of practical operation. Only through practical operation can the mistakes that students often make in learning be solved in a timely manner. In addition, appropriate arrangements should be made for field trips, research, internships and other activities, which would help broaden students' horizons and strengthen students' practical ability.

## 5. Conclusions

In recent years, with the rapid development of technologies such as computers, mobile networks, and the Internet of Things, various fields are undergoing transformation and development driven by intelligent big data. The development of students' practical skills in practical application is very crucial since engineering cost has a great application value. At this time, it's important to fully utilize the benefits of the network environment. At present, it is necessary to give full play to the advantages of the network environment, carry out the teaching of theory and practice under the guidance of architectural examples, and train high-level technical personnel in a more efficient way through the network. This paper aims at the grayscale characteristics of the teaching practice quality evaluation system in the intelligent big data environment. It is used for qualitative and quantitative analysis, and the focus is on the teaching practice quality evaluation in the intelligent big data environment. This paper proposes a method based on cloud model-grey relational analysis to evaluate the quality of teaching and illustrate its usefulness. The development of intelligent teaching tools would help to improve the teaching level in the era of big data. Although the construction of teaching resources is a long and protracted process, but through a reasonable approach and internal resource construction, after a long period of efforts, we can certainly achieve better results. There is a lack of comparison between traditional courses and courses based on intelligent big data in the experiment, and attention should be paid to adding this step in future work.

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