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Research Article

Analysis of Influencing Factors of Teaching Effect Based on Structural Equation Model

Xin Xu

Undergraduate Academic Affairs Office, Shandong University of Arts, Jinan, Shandong 250000, China

Correspondence should be addressed to Xin Xu; z00079@sdca.edu.cn

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Structural equation model is a multivariate statistical analysis method. It can not only test some unpredictable abstract ideas, but also design parameters for the causal connection model between independent variables and dependent variables. Among them, the analysis of various latent variables is based on the verification factor analysis technology. The research first collects various relevant data, derives the latent variables and measurement variables, then composes the measurement model, and then verifies the adaptability of the measurement model structure mode through actual data collection. When such suitable factors are determined, a causal model based on path analysis technology for latent variables, that is, a structural model, can be used for parameter design. This article uses the structural equation model as an analysis tool, starting from the three aspects of teachers, cases, and students to evaluate the application effect of the case teaching method in the classroom teaching of intellectual property law course and construct a structural equation model of the influencing factors of the case teaching effect. To understand students' satisfaction with case teaching effects and related influencing factors, the research results show that the effect of case teaching is jointly affected by the level of teachers, case selection, and student response. Among them, teacher factors have the greatest impact on case teaching effects, followed by case factors, and students have the least.

1. Introduction

Case teaching method is a very effective teaching method based on cases and finding the appropriate combination of theory and practice. It has clear purpose, objective reality, strong comprehensiveness, profound inspiration, highlights practice, student-centered, dynamic process, and the results are diversified. Since being introduced to China as a new teaching method in the mid-1980s, case teaching method has gradually been accepted by more and more people, and it has been proved to be an effective and special effect in teaching practice [1]. The participants in the classroom case teaching process include teachers and students. The teaching effect is affected by multiple factors, and many factors cannot be directly measured, which increases the difficulty of evaluating the effect of case teaching. In the existing literature on case teaching effect evaluation, scholars often use the analytic hierarchy process to establish an index system for case teaching effect evaluation then combine the principal component analysis method and the analytic hierarchy process to construct a comprehensive evaluation model for the case teaching effect, and analyze the influences and various factors of effect evaluation [2]. Structural equation model is a systematic statistical method to find the hidden latent variables between the measurable variables and the causal relationship between the latent variables by analyzing the measurement data of the measurable variables. It can solve the influencing factors in the course evaluation of diverse problems that cannot be directly measured [3]. The structural equation model can be used to discover the factors that affect the effect of case teaching and the degree of influence of each factor, so as to provide targeted countermeasures and suggestions for improving the effect of classroom case teaching.

This paper selects teachers, cases, and students that are closely related to the effect of classroom case teaching, uses structural equation modeling to evaluate the effect of case teaching, and discusses the direct and indirect effects of the

three factors on the effect of case teaching [4]. Based on this, this article starts with the three factors influencing the effect of case teaching and proposes suggestions for improving the quality of case teaching and improving the effect of case teaching.

(1) Teachers play an extremely important role in classroom case teaching. Teachers' professional knowledge level, classroom control ability, ability to select and grasp cases, and language appeal in the process of case analysis will affect students and the final teaching. Therefore, as far as teachers are concerned, "To forge iron, one must be strong" [5]. First, they must strengthen their professional knowledge, improve their own professional level, and be able to identify and screen valuable and meaningful cases; secondly, they must rationally design the case teaching process. The time of theoretical teaching and case teaching is more important and appropriate. Only focusing on theoretical knowledge points will make students feel boring; focusing only on case analysis will make students feel confused and unable to achieve good teaching results [6]. In addition, the language used by teachers in the course of teaching must be contagious, so as to arouse the classroom atmosphere and stimulate students' enthusiasm for participating in case analysis and discussion, so that students will have a collision of ideas in the process of discussion and achieve good teaching results.

(2) Cases are the carrier of case teaching, and selecting appropriate teaching cases is very important. The current cases in the field of intellectual property law are numerous and complicated, and the quality is uneven. The quality of case selection should be paid attention to [6]. The case is not as good as it is. It is necessary to select cases close to the actual life of students or hot social cases, so as to arouse students' interest, mobilize students' enthusiasm for participation, and achieve good teaching results. Teachers should select cases based on their own knowledge, experience, practical experience, etc., and avoid large, empty, or outdated cases. The case selection and case analysis process must be under the control of the teacher. The teacher must understand and be familiar with the environmental background, field, related issues, and knowledge points involved in the case; otherwise, there may be an embarrassing situation where the case has been introduced and ended in a hurry [7]. In addition, cases should be mainly localized or even local, to avoid blindly choosing international cases that students are not familiar with. At the same time, we should focus on lifelike "three-dimensional" cases and try to minimize dull "flat" cases. If the case can resonate with the students, the students will be more motivated to participate in the analysis and speech, which can avoid falling into a cold field or a dispute.

(3) Students are the main participants in case teaching. The traditional teaching model for a long time has made students develop the habit of relying on teachers in the classroom, and case teaching is to fully mobilize students' learning enthusiasm and turn passive to active [8]. Case analysis involves a large span of knowledge, requiring students to have a relatively solid professional basic knowledge and a relatively complete knowledge system, as well as basic case analysis skills, to be able to easily understand the problems raised by the case and be correct in the place that is connected with the knowledge points to be investigated in the case. Classroom case teaching is limited by time issues, and some content cannot be specifically analyzed. This requires students to track and think about the case in time after class, such as accessing information and knowledge points related to the case through the Internet or library materials and timely checking for omissions to fill up the vacancy and consolidate the knowledge learned. It should be pointed out that this article focuses on evaluating the effect of case teaching from the case teaching process, without considering students' test scores, and the samples are limited to logistics management students. Therefore, the appropriateness and validity of relevant conclusions need to be further studied. Generally speaking, the establishment of systematic and high-quality case library resources, strengthening teacher training, improving teachers' professional quality, correctly guiding students, and changing learning habits will be key issues to be solved in the future of case teaching [9].

2. Conceptual Model and Research Hypothesis

2.1. Teaching Effect Model. Structural equation model is a method of establishing, estimating, and testing causality model. The model contains not only observable explicit variables, but also latent variables that cannot be directly observed. Structural equation model can replace multiple regression, path analysis, factor analysis, covariance analysis, and other methods to clearly analyze the effect of individual indicators on the overall and the relationship between individual indicators.

The teaching effect belongs to a relatively abstract and difficult-to-determine concept. There are multiple measurement indicators. The evaluation content generally includes the judgment of the teaching process and teaching effect, but the focus of case teaching is more on the perception, feeling, and ability of students' training and construction [10]. Case teaching is based on certain teaching objectives. In the teaching process, appropriate case teaching materials are used in a targeted manner. Under the guidance of the teacher's subjective consciousness, with the help of students' self-independent thinking and collective cooperation, they are doing inquiries and analysis of the case, ask their own questions, look for various potential solutions to the problem, and make corresponding decisions, so as to

effectively improve the students' theoretical level and practical ability of teaching methods. Therefore, the effect of case teaching can be judged from the three aspects of teachers, cases, and students, and the way of influence between each other and the specific impact on case teaching is compared and analyzed [11]. Analyzed from the perspective of teachers, the role played by teachers in teaching activities is the organizer and guide of teaching activities, and their role is of vital importance. The teacher's professional ability and the ability to control cases directly affect the selection of cases and the actual effect of case teaching. And in the teaching process, the teacher's organization and design of teaching activities, language rendering, and the proportion of case teaching arrangements also directly determine the degree of mastery and acceptance of students. In short, it is the coordination of teaching activities.

Based on this content, a content hypothesis $A_1 \sim A_3$ can be proposed.

(i) A_1: the teacher's ability has an obvious positive influence on the selection of cases.

(ii) A_2: the teacher's professional ability has an obvious positive impact on the student's responsiveness.

(iii) A_3: the teacher's ability has obvious positive influence on teaching effect. At the case level, selecting an appropriate case is the core of case teaching [12]. The actual quality of a case, the specific quantity, source channel, etc., all have the final impact on the actual quality of case teaching. The cases selected by teachers will also have a direct impact on students' interest and participation. In this study, the actual quality, specific quantity, and source channels of the cases were used to determine the selection of cases and the impact on teaching effects. On this basis, hypotheses A_4 and A_5 were successively proposed [13].

(iv) A_4: the selection of cases has a significant positive impact on the actual teaching effect.

(v) A_5: the selection of cases has an obvious positive impact on students' responses. From the perspective of students, students are the main participant group in the case teaching process. Whether students have strong and effective case analysis ability, their actual participation in the case teaching process and their specific understanding of the case will all affect students, whether they can pay more attention to the case and its actual effect has obvious influence. Therefore, referring to this foundation, with the aid of basic analysis ability, student participation ability, comprehension ability, effort level, etc., the impact on student's teaching effect is judged, so hypothesis A_6 can be used.

(vi) A_6: there is a positive impact of students' specific reactions on the actual teaching effect. In the above analysis, you can simply organize a conceptual structure diagram of case teaching effects and specific influencing factors, as shown in Figure 1.

2.2. The Basic Principle of Structural Equation Model. In the daily research process, researchers usually face two types of problems, quantitative and qualitative. Regarding the study of quantitative issues, there is already a relatively mature measurement and analysis method, but there is generally no specific way to deal with some qualitative issues that cannot be directly calculated. For example, the new curriculum reform has become a key issue in the transition from exam-oriented education to quality education. The investigation of student learning effects has become the most important issue in the education field. To accurately understand the degree of student satisfaction with the teaching method, it is necessary to fully understand the student three-dimensional analysis of classroom teaching quality, educational environment, teachers' teaching methods, and their own mastery degree being done, and at the same time, the interrelationship between these relationships is analyzed [13].

However, how do issues such as classroom teaching quality, teaching environment, teachers' teaching methods, and their own mastery affect job satisfaction, and how are these concepts related to each other? To solve these problems, you can rely on the establishment of structural equation models. After the structural equation model is established, various abstract and unmeasured variables can be regarded as latent variables. For example, the teaching quality, teaching environment, teacher's teaching methods, and students' own mastery degree mentioned in the previous article are all variables. All the corresponding latent variables need to be determined by various related indicators that can be directly measured. These indicators are generally called decision variables or explicit variables. There are basically two basic models in a complete structural equation model, namely, the measurement model and the structural model. The measurement model expresses the relationship between the latent variable and the response measurement variable, which is mainly expressed by the load of the factor; the structural model expresses the various causal connections between the latent variables, with the aid of the coefficient relationship of the path [14]. People generally like to construct structural equation models with the help of path diagrams, as shown in Figure 2.

The measurement model and the structural model constitute the main components of the structural equation model. The measurement model is the confirmatory factor analysis model, which is used to verify the relationship between the latent variables and the observed variables, and the structural model is the model used to verify the relationship between different latent variables. We, respectively, introduce them as follows.

The structure model form is as follows:

$$y = \lambda y + \delta x + \zeta, \tag{1}$$

where y is the potential endogenous variable; x is the exogenous latent variable; λ is the structural coefficient matrix, which reflects the mutual influence between the constituent factors of the latent dependent variable matrix in the structural model y; δ is the structural coefficient matrix, which reflects the structural model. The influence of the

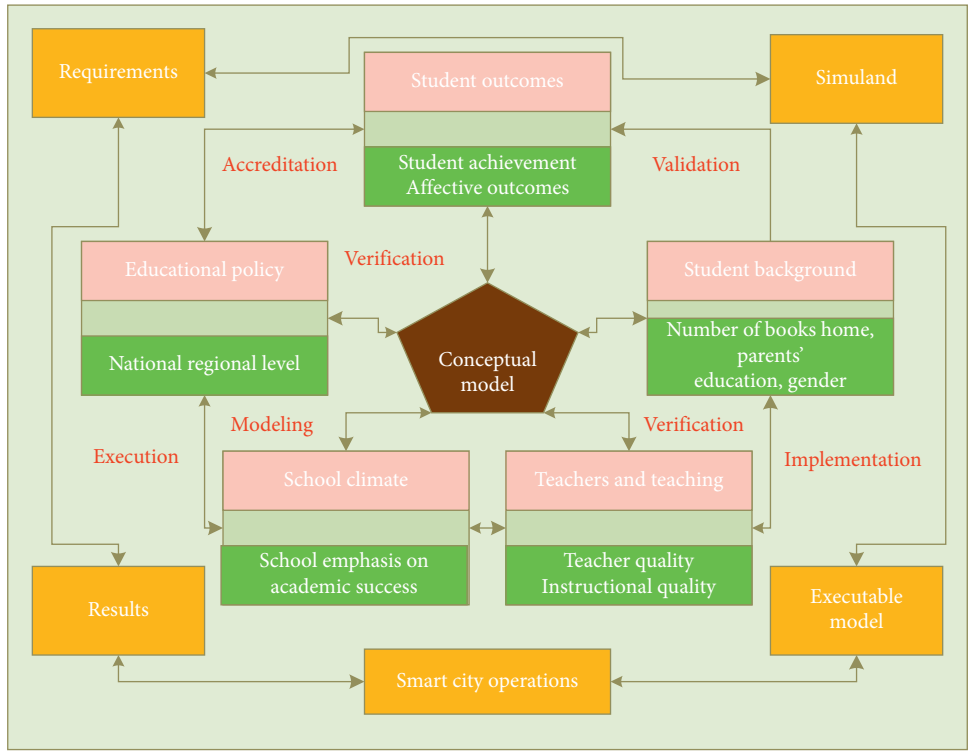

Figure 1: The conceptual composition model of the influencing factors of case teaching effect.

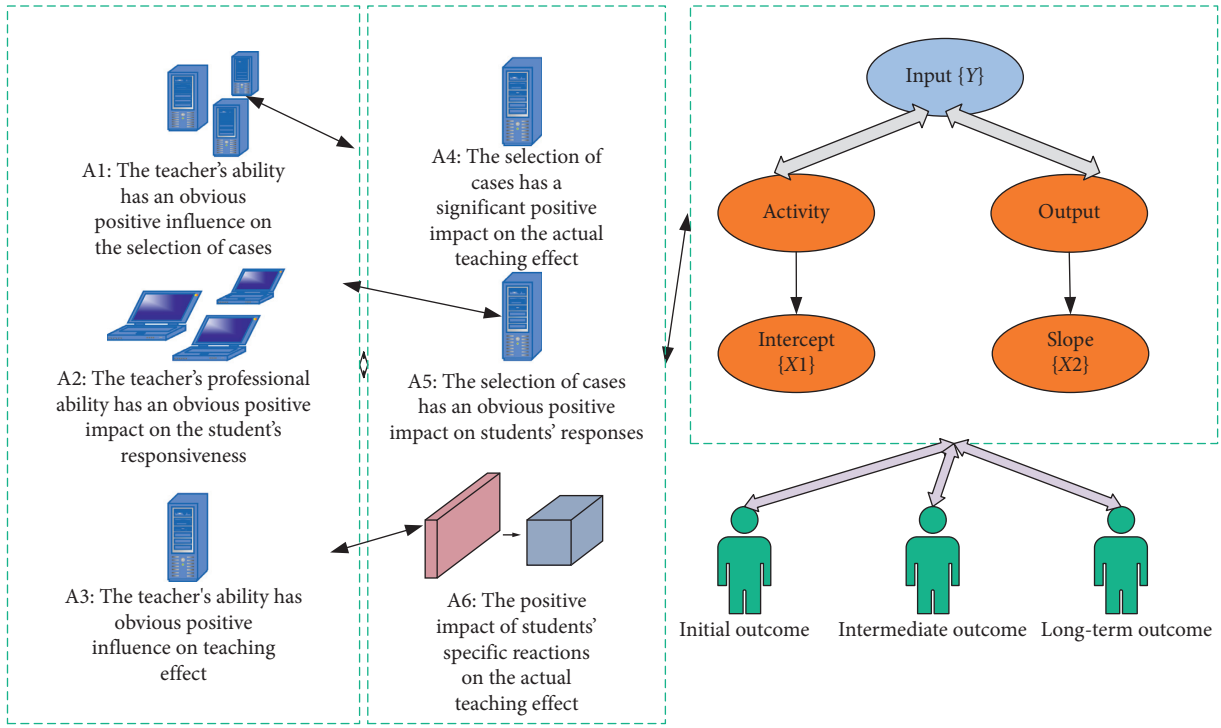

Figure 2: Structural equation model.

latent independent variable matrix on the latent dependent variable matrix ζ; ζ is the residual matrix of the structural equation model y; it reflects the part that cannot be explained in the equation.

The measurement model form is as follows:

$$x = \Lambda\gamma + \varepsilon. \tag{2}$$

In the equation,x is the measurement variable matrix γ, Λ is the measurement coefficient matrix, which measures the relationship between the potential exogenous variable matrix γ and its measurement variable matrix x; γ is the potential exogenous variable matrix; and ε is the residual matrix of the exogenous index.

People generally like to construct structural equation models with the help of path diagrams, as shown in Figure 3, which is an overall structural equation model diagram. Among them, the measured variables are expressed in rectangles, the latent variables are expressed in elliptical shapes, and the causal relationship between them is expressed by arrows. i, $i = 1, 2, 3, ...$, each represents the residual value of the relative measured variable, that is, the part of the measured variable that is not decomposed, and represents the residual of the latent variable Y-value; factor load number represents the relationship between the measured variable and the relative latent variable, but the path coefficients, respectively, represent X_1 and Y, X_2 and the causal link between Y [15].

2.3. Basis for Model Selection

(1) It satisfies the condition that both the dependent variable and the independent variable contain measurement errors. In real life, measurement errors are ubiquitous. But in statistical measurement, in order to simplify the model and to control variables, we have to allow only some variables to have measurement errors (dependent variables) while controlling the independent variables. The structural equation model relieves this limitation, increases the accuracy and authenticity of the problem research, and greatly improves the credibility of the structural equation model's operating results.

(2) Structural equation model can simultaneously study the relationship between multiple dependent variables. The structural equation model realizes the integration of factor analysis and regression analysis. It is the product of the combination of these two models. It makes up for the defect that traditional factor analysis cannot handle the relationship between multiple variables at the same time. And we know that traditional statistical models deal with a single problem. Even if sometimes it seems to be able to deal with the relationship between multiple dependent variables, its essence is to calculate the correlation between certain two dependent variables one by one and still use other variables. The impact of this is excluded.

(3) Allow the measurement model to have greater flexibility. Structural equation model breaks the traditional model of thinking that one indicator can only correspond to one factor. One-to-many (the correlation between an indicator and multiple variables) or more complex many-to-many (high-order factors) models are also the reasons why most scholars use structural equation models.

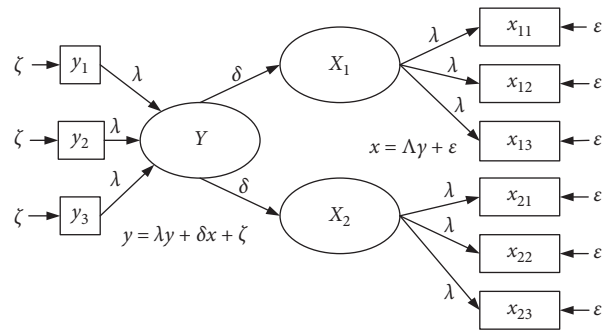

Figure 3: Structural equation model design.

(4) Estimate the fit of the entire model. Through the parameter estimation results of the structural equation model, we can understand the influence of different indicators on each factor and estimate the goodness of fit of the entire model and the fit between the model and the data based on the model operation results. In addition, we can also use the structural equation model to perform multigroup analysis, that is, to test the robustness of the model. This is achieved by building different models to fit unified data or using the same model to fit different data. By comparing the goodness of fit, the model with the best goodness of fit is determined.

(5) Structural equation model can realize synchronous verification of factor structure and factor relationship. When we study the correlation between latent variables in actual problems, each latent variable we study is a variable that is not directly observable, expressed by multiple indicators or topic measurements. Our traditional method is to use factor analysis to calculate the correlation coefficient of the index corresponding to each latent variable, then obtain the value of each latent variable based on this, and finally calculate the correlation between latent variables. In the structural equation model, we can realize the simultaneous implementation of factor analysis and structural relationship verification, which reflects the flexibility and simplified operation of the structural equation model.

3. Fitting of Structural Equation Model and Classroom Case Teaching

3.1. Questionnaire Design and Survey. Modeling and analyzing data through structural equation model is a dynamic process of continuous modification. In the process of modeling, the researcher must analyze the rationality of the model through the results of each modeling calculation, then constantly adjust the structure of the model based on experience and the fitting results of the previous model, and

finally get a best model [16]. A reasonable model is a one that matches the facts.

In the application of the verification model (SC), from the perspective of the user, there is only one model that is the most reasonable and most consistent with the data investigated. The purpose of applying structural equation modeling to analyze data is to verify whether the model fits the sample data, so as to decide whether to accept or reject the model. This type of analysis is not too much, because whether it is accepting or rejecting this model, from the perspective of the application, it is still hoped for a better choice.

In the selection model (AM) analysis, the structural equation model applicator proposes several different possible models (also called alternative models or competitive models) and then decides which model is based on the pros and cons of each model's fitting of the most desirable sample data. Although this type of analysis is more than validated models, from the perspective of application, even if the model applicator gets the most desirable model, he still has to make a lot of changes to the model, which becomes the production model class analysis.

In generating model analysis (MG model), the model user first proposes one or more basic models and then checks whether these models fit the sample data. Based on the theory or sample data, analyze and find out the part of the model that does not fit well, modify the model accordingly, and use the same sample data or other sample data of the same kind to check the fit of the modified model [17]. The purpose of such an entire analysis process is to produce an optimal model.

Therefore, in addition to being used as a verification model and comparing different models, structural equations can also be used as evaluation models and correction models. Some structural equation model users start with a preset model and then verify this model and the sample data they have [18]. If it is found that the preset model does not fit the sample data very well, then modify the preset model and then check again, and repeat this process until finally a model application person thinks that it fits the data to achieve his satisfaction, and at the same time each parameter estimate also has a reasonable explanation model.

This article takes the course of intellectual property law as an example to carry out classroom case teaching. Intellectual property law is a course that is both theoretical and practical. It requires students not only to master theoretical knowledge such as boring legal provisions, but also to have the corresponding ability to analyze and solve practical problems. It is a very suitable course for case teaching course. The questionnaire designed a total of 15 questions, covering the above four aspects of teacher level, case selection, student response, and teaching effect [19]. In order to have a deep and comprehensive understanding of the students' specific feelings about the course, all question items are based on the Likert ten-level scale (1 means "very low" or "very poor"; 10 means "very high" or "very high") [20]. Take measurements and ask students to answer objectively and truthfully based on personal feelings. The subjects of the survey were all students of the 2018 and 2019 majors in cultural industry management who participated in the intellectual property law course. After the course, the questionnaire was issued to guide the students to fill in and collect them, and a total of 145 valid samples were formed. The latent variables, measurable variables, and their meanings of the model are shown in Table 1.

3.2. Questionnaire Reliability and Validity Test. Reliability and validity are the two main indicators for evaluating the quality of questionnaires. Reliability refers to the degree of consistency or stability of measurement results (data) [21]. Cronbach's coefficient (Cronbach' α) is a more commonly used test method. The larger the α coefficient, the greater the correlation between the items, that is, the higher the degree of internal consistency. It is generally believed that the ideal α is above 0.7. This paper uses SPSS16.0 to analyze the internal consistency of the data [22]. The results show that the α coefficient of the total scale has reached 0.925, and the α coefficients of each subscale are shown in Table 2 and Figure 4.

It can be seen that the design of the questionnaire is reasonable, and the data used in the case has high reliability. Validity refers to the degree to which the measurement tool can correctly measure the characteristic to be measured [23], which generally includes content validity and structure validity. The measurable variables selected in this article refer to a large number of relevant literatures and have been repeatedly considered and modified based on interviews with students, so they have good content validity. The structural validity reflects the degree of homogeneity between the evaluation results and the expected evaluation content. KMO and Bartlett's test were performed using SPSS. The results are shown in Table 2. Kaiser gave a commonly used KMO metric; that is, the value of KMO is above 0.7. It can be seen that the questionnaire has passed the structural validity test, and the data in the scale is suitable for factor analysis.

3.3. Structural Equation Model Fitting. The structural equation model belongs to a confirmatory factor analysis method with its own latent variables (confirmation method analysis, CFA). The output path standardization coefficient and model are shown in Table 3. It can be found in Figure 5 that the bearing numbers between the measured index factors are all above 0.5, indicating that the model has a good degree of fit [24]. In order to show the degree of fit of model verification more clearly, it is generally chosen to use more fitting indices to illustrate. See Table 3 for details. The displayed results indicate that the indicators of this model have achieved acceptable levels. From an overall perspective, the model has a high degree of fit.

3.4. Verification Results. According to the six hypotheses established above, specific verification results can be obtained. For detailed data, see Table 4 and Figure 6. The data in the table shows that the various hypotheses described above are supported by theory, as shown in Figure 7.

The degree of influence of each latent variable on the teaching effect is the result of direct influence and indirect influence. The total influence coefficient can be determined by calculating the sum of the direct influence coefficient and the indirect influence coefficient (see Table 5 and Figure 8).

Table 1: Correspondence table of latent variables, measurable variables, and their meanings.

Latent variable	Teacher level			
Measurable variables	Teaching process design	Professional knowledge level	Control over cases	Language appeal
Meaning of measurable variables	Teacher's design level of case teaching process	Teacher's professional knowledge level displayed in case teaching	Teacher's ability to control case analysis process	Teacher's mental outlook and language appeal in case analysis process
Latent variable	Case selection			
Measurable variables	Case study hour proportion	Case quality	Case number	Case source
Meaning of measurable variables	How reasonable the number of hours and proportion of case teaching arranged by the teacher in the classroom	The quality of the cases used in classroom teaching	The number of cases used in classroom teaching	The source of cases used in classroom teaching channel
Latent variable	Student reaction			
Measurable variables	Basic analytical skills	Student participation	Student understanding	Student effort
Meaning of measurable variables	The basic skills that students have in case analysis	Students' participation and cooperation in the case teaching process	The ease with which students can contact case investigation knowledge points when analyzing cases	Students ability to check materials after class or search for information related to the case online activeness
Latent variable	Teaching effect			
Measurable variables	Student interest degree	Student ability improves	Student satisfaction	
Meaning of measurable variables	The degree of student's interest in using case-based teaching for this course	The degree to which students improve their ability to analyze problems after receiving case-based teaching	The degree of satisfaction of students with case teaching for this course	

Table 2: Reliability and validity test.

Latent variable coefficient	Number of measurable variables	Reliability Cronbach's α	Validity KMO and Bartlett's test
Teacher level	4	0.926	0.752
Case selection	4	0.864	0.869
Student reaction	4	0.817	0.754
Teaching effect	3	0.925	0.725
Total table	15	0.924	0.914

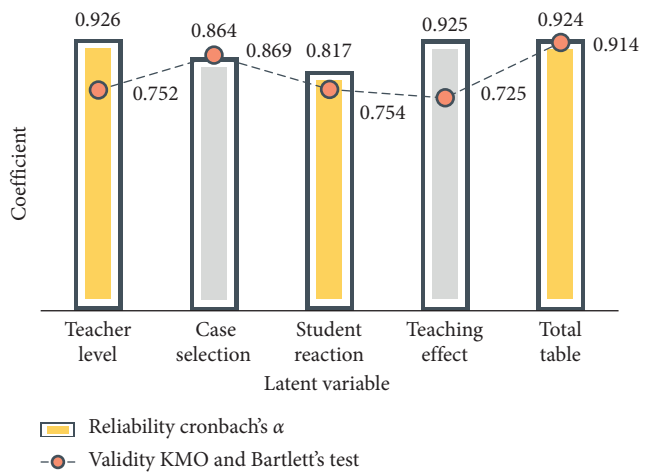

Figure 4: Reliability and validity test results.

Table 3: Comparison of model fitting indexes.

Type	CMIN	CFI	NFI	TLI	RMSEA	AIC
The recommended value	1<CMIN/DF < 5	>0.9	>0.9	>0.9	<0.1	The smaller, the better
Test result	2.248	0.946	0.928	0.942	0.074	254.392
Accept	Yes	Yes	Yes	Yes	Yes	Yes

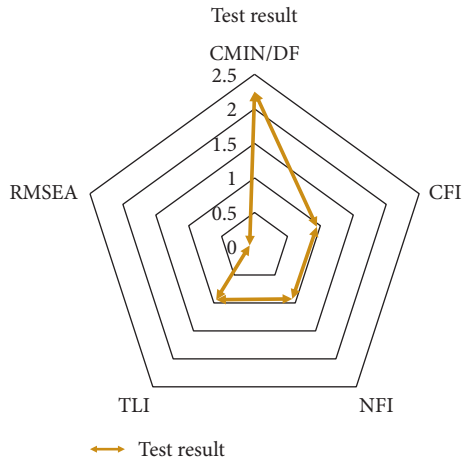

Figure 5: Comparison of model fitting indexes.

Table 4: Specific verification results of research hypotheses.

Research hypothesis	Indexed path parameters	C. R.	Validation results
A_1: case selection < teacher's professional ability	0.834	8374	Affirmative
A_2: student feedback < teacher's professional ability	0.465	4.372	Affirmative
A_3: classroom effect < teacher's professional ability	0.247	3.472	Affirmative
A_4: classroom effect < case selection	0.274	2.48	Affirmative
A_5: feedback from students < case selection	0.437	2.483	Affirmative
A_6: classroom effect < student's feedback	0.274	3.427	Affirmative

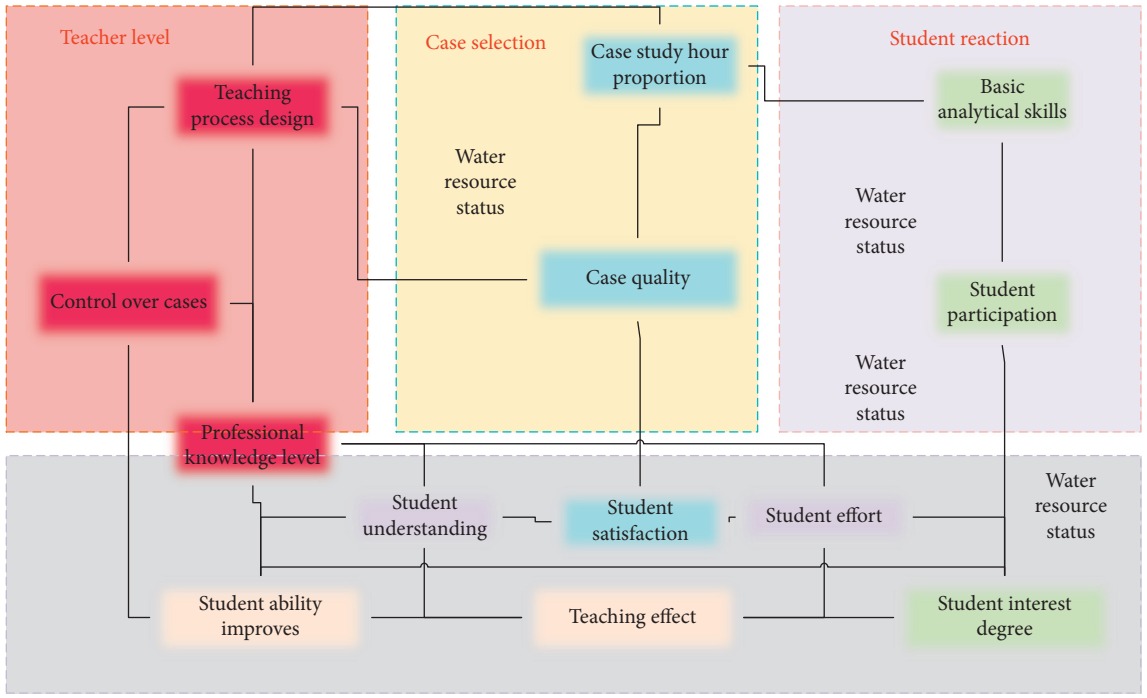

Figure 6: The structure equation model and specific path parameters of case teaching effect evaluation.

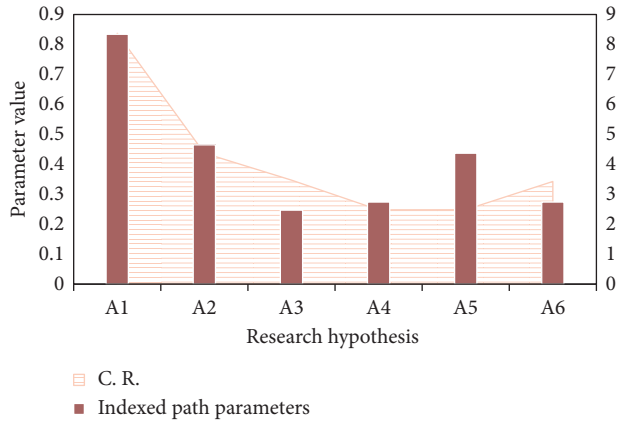

Figure 7: Specific verification results of research hypotheses.

Table 5: The influence of each latent variable on teaching effect.

	Direct influence coefficient	Indirect influence coefficient	Total influence coefficient
Teacher level	0.274	0.453	0.473
Case selection	0.256	0.126	0.463
Student response	0.353	0.002	0.369

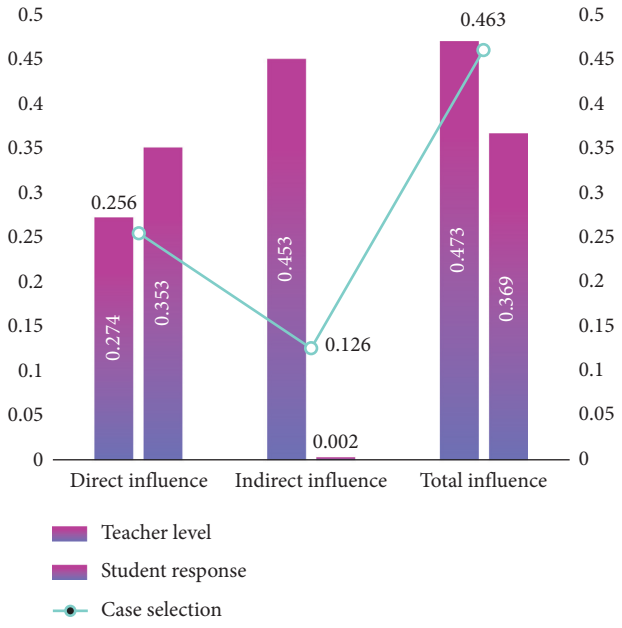

Figure 8: The influence of each latent variable on teaching effect.

The analytic hierarchy process is mainly aimed at the research that there are many reference index systems and various specific indexes, and the index values cannot be accurately assigned. First, build several target levels and classify specific indicators based on the relationship between the indicators and the target level. Secondly, filter and add indicators through expert analysis and brainstorming methods. Finally, assign values to each indicator. In order to build an index system, the analytic hierarchy process generally includes three levels: objectives, guidelines, and plans. For the indicators that have relevance, the applicability of the indicators can be evaluated through comparative analysis, which can be used for the screening and assignment of research indicators.

4. Conclusion

The teaching effect analysis of this study is based on the case teaching effect as the research basis, selecting teachers, cases and students, and other parameters, using the structural equation model to evaluate the case teaching effect, and analyzing the parameters between various aspects to case teaching. The direct and indirect effects caused by the effect further verify the six hypotheses set in the article. On this basis, the article considers the three analysis factors of the case teaching effect, sets the influence of the tripartite parameters to enhance the case teaching effect, and proposes how to improve the quality of case teaching and how to deepen the case teaching effect. The role of teachers in the classroom teaching process is very important. The level of teachers' professional ability and the ability to control the operation of the classroom will have a direct impact on the teaching effect, so teachers need to improve their professional quality and control the classroom scheduling.

Data Availability

The data used to support the findings of this study are available from the author upon request.

Conflicts of Interest

The author declares that there are no known conflicts of interest reported in this paper.

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