

# College Teaching Quality Evaluation Based on System Dynamics Model

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**Abstract.** This paper analyzes the main factors that influence the teaching quality and the cause and effect relationship between them, using system dynamics to establish the evaluation model of teaching quality in Colleges and universities. Taking a college A for example, this model is induced in the simulation of teaching quality, then the change process of teaching quality and feedback mechanism between these effective factors is proposed, as well as the teaching quality change under different policy parameters. And with the purpose of improving teaching quality, some measures are put forward, including staff quality, management quality, organization quality and environment quality.

## 1 Introduction

With the function of teaching quality in colleges and universities is teaching at the mouth of the regularity of metrics, shall be formulated by the educate and the social comprehensive requirements[1]. Enrollment expansion of colleges and universities to promote the development of higher education in our country, but also brings the new challenges to college teaching and education work. Teaching quality is the core of education activities in colleges and universities, teaching quality evaluation is to improve the teaching activities in colleges and universities, the key to improve the level of education in colleges and universities. Teaching quality evaluation is to follow the law of education teaching within the premise, according to the related policy, regulations and school personnel training, using the theory of education evaluation and scientific technology in teaching process and its result was analyzed and the quantitative judgment technical management style[2]. At present, one more is the reform of the teaching quality and teaching quality evaluation of qualitative research [3-5], the other is from the Angle of quantitative teaching quality evaluation [6-8], but these can't reveal the evaluation method of teaching interaction effects between various factors in the system. From 1956 since the founding of system dynamics, the social, economic, ecological, and other fields has been widely applied, has been hailed as a social economic system of laboratory. Using system dynamics modeling, can consider a dynamic and complex system of all kinds of main influence factors, the system can be more fully analysis, the conclusion can also conforms to the actual situation, system dynamics has been widely used in the system evaluation. This paper constructs the system dynamics model of university teaching quality evaluation, the model considering the factors of affecting the quality of teaching and the relationship between

various factors and form an overall structure and quantitatively describe the complexity of the relationship between the factors, can be used to analyze the development trend of the teaching quality, find out the regulation of variables, the parameters and structure in different policy under the condition of the teaching quality, in order to put forward effective measures for the reform of the teaching quality.

## 2 System analysis of the teaching quality

### 2.1 Limit analysis of teaching system

Analysis of the teaching quality system should first preliminary delineate the boundaries of the teaching quality system, in order to determine the endogenous variables and exogenous variables and input, determine the behavior of the system reference model. Draw system line should be refined to simplify, what interests will consist of the behavior of the system must be variable. Teaching activity is "teaching" and "learning" bilateral activity, including teacher's "teaching" and students "learning", "tube" of teaching management, supplemented by a variety of teaching media. From the perspective of the nature of teaching system, teaching system by the "teacher", "students", "teaching environment", "teaching management" of four elements (figure 1). In figure 1 Scientific management refers to the system through certain measures to the specific requirements of the teacher how to perform the duties of a teaching, culture management is through certain incentives to pass higher education idea to teachers, to fully arouse the enthusiasm of teachers and potential to work creatively carry out personnel training.

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In this paper, considering the four essential factors of the teaching system and the factors affecting the quality of teaching, teaching environment, teaching management quality, quality of teachers' quality, teaching organization as the main variables which influence the teaching quality, according to the four variables, divide the system boundaries. Teaching environment and teaching quality management quality with the above analysis, including teachers teaching echelon, the knowledge structure of teachers' quality, the concept of teacher education. Teaching echelon including teacher education titles, etc.; Teachers' knowledge structure including teacher's practical knowledge and implicit knowledge; Teachers education concept is based on the higher education idea formed by the understanding of the concept. Teaching organization quality mainly includes the teaching contents, teaching methods and teaching quality. Any links and stages in the process of teaching, all have important influence on the quality of teaching, the factors affecting the quality of teaching is various, multi-level and variety.

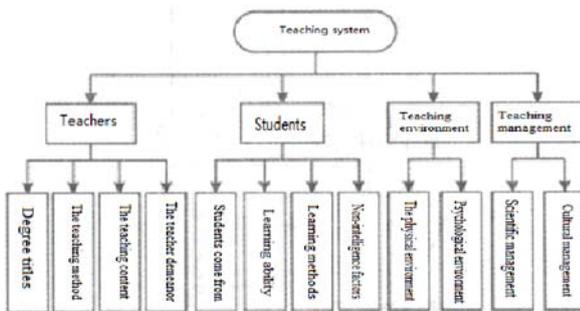


Figure 1. teaching system

### 2.2 Causality analysis of college teaching quality system

Able to clearly express the causal feedback loop in the system set victory of the relationship between the elements, is the key to the system dynamics research. Based on the system boundary and the relationship between the various factors, can be concluded that teaching quality evaluation system dynamics model of causality diagram (figure 2), figure in the causal chain with a plus or minus sign indicates that the effect of nature, plus said arrow pointing in the direction of variables will increase as the arrow source variable, or reduce the; Minus sign says the opposite relationship between variables.

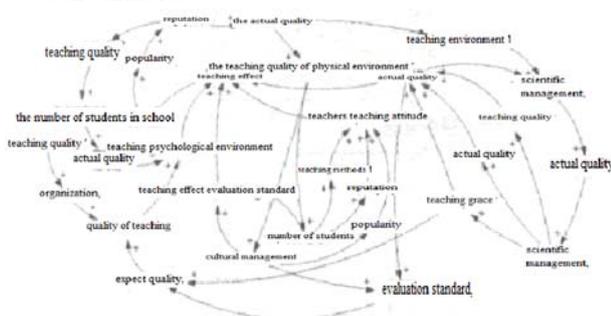


Figure 2. Causality diagram in teaching quality evaluation system

Figure 2, the main positive feedback loop ①-⑥ and negative feedback loop ⑦ all landowners

- ①the actual quality ↑ , teaching quality ↑ , reputation and popularity ↑ , the number of students in school ↑ , teaching fund input ↑ , the teaching quality of physical environment ↑ , teaching environment ↑ , the actual quality ↑
- ②the actual quality ↑ , teaching quality ↑ , reputation and popularity ↑ , the number of students in school ↑ , expect quality ↑ , teaching effect evaluation standard ↑ , teaching management quality ↑ , the actual quality ↑
- ③the actual quality ↑ , teaching quality ↑ , reputation and popularity ↑ , the number of students in school ↑ , expect quality ↑ , teaching effect evaluation standard ↑ , scientific management ↑ , quality of teaching organization ↑ , the actual quality ↑
- ④the actual quality ↑ , teaching quality ↑ , reputation and popularity ↑ , the number of students in school ↑ , expect quality ↑ , teaching effect evaluation standard ↑ , cultural management ↑ , the teaching methods ↑ , quality of teaching organization ↑ , the actual quality ↑
- ⑤the actual quality ↑ , teaching quality ↑ , reputation and popularity ↑ , the number of students in school ↑ , expect quality ↑ , teaching effect evaluation standard ↑ , cultural management ↑ , teachers teaching attitude ↑ , teaching grace ↑ , teaching psychological environment ↑ , quality of teaching organization ↑ , the actual quality ↑
- ⑥the actual quality ↑ , teaching quality ↑ , reputation and popularity ↑ , the number of students in school ↑ , expect quality ↑ , teacher quality standards ↑ , improving teachers' cognitive degree ↑ , structure of teachers ↑ , teachers' quality ↑ , the actual quality ↑
- ⑦ teachers' quality ↑ ,to improve teachers' cognitive degree ↑ , introducing high level teachers ↑ , teachers structure ↑ , the quality of teaching staff ↑

## 3 Collges and universities teaching quality evaluation system dynamics model

### 3.1 Model building

Causality diagram describes the system structure of the basic party, reflects the variable trend of increase or decrease, is qualitative analysis. Flow graph can clearly describe the structure, the relationship between state and the rate of change regularity and gives a quantitative relation between variables, describe feedback system dynamic performance of the cumulative effect. To grasp objectively and quantitative evaluation of teaching quality, according to the causality diagram analysis of college teaching quality evaluation, established the dynamic model of university teaching quality evaluation system of flow diagram (figure 3).



policy, seek a more reasonable strategies to improve the teaching quality.

#### 4 Improving the quality of the teaching strategy

Teaching quality evaluation system dynamics model not only can evaluate the quality of teaching, can also predict the development trend of the quality of teaching, simulation teaching quality under different policy trends, to provide decision support for improving the teaching quality. From model analysis shows that the quality of teaching reform from teaching environment, teaching management quality, organization of teaching quality and teaching quality of four parties and, according to the specific situation of the school, take the appropriate measures.

(1) the teaching reform of environmental quality. Environment quality can improve teaching from teaching physical environment and psychological environment for both sides. Teaching and physical environment, increase the teaching facilities, equipment, site, such as fixed asset investment, introduce advanced technology at the same time to improve teaching methods. With the advent of the era of mass education, college students' quality on the whole, at this point, the school should pay attention to the cultivation of the students study more, at the same time in order to strengthen the management of teachers' culture, improve teachers' education concept and teaching attitude, promote the formation of good teaching.

(2) the quality of teaching management reform. Schools must clear their own talent training goal and the education idea, and make it into the teaching management. There can improve the quality of the teaching management from the scientific management and culture management for both sides. Scientific management, reasonable teaching plan, improve the system of teacher evaluation, supervise and urge teachers to complete the teaching work; Culture management, the innovation incentive constraint mechanisms, deepen understanding teachers for higher education target, to standardize the behaviour of teachers and arouse teachers' potential, improve teaching level.

(3) the quality of teaching organization reform. First, select teaching materials and teaching reference books to form a complete knowledge system; Secondly through the teaching management, formulate reasonable, conform to the talented person education target teaching content; Through scientific management, supervise and urge the teacher fully preparation, teaching system and to build their own style, using new teaching means, to form the unique teaching methods.

(4) reform of teachers' quality From the point of teaching team, pay attention to introduce high levels of teachers, improve the quality of teachers from the number. At the same time should pay attention to all teachers and professional development, pay attention to teachers' personal development orientation, education idea, training teachers to attach importance to practical experience and professional development for teachers,

improve teachers' professional ability, and improve the quality of teachers from the quality.

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#### References

1. Y. D. Wang, Views on the current high school undergraduate teaching quality, *China University Teaching*, No.3, 4-14(2008)
2. Sh. Liu, Sh. Li, Theory of the science of teaching quality evaluation system of institutions of higher learning, *Modern Education Science*, No.7, 155-157(2011)
3. B. Z. Gong, L. B. Li, The popularization of higher education under the condition of talent training quality evaluation, *Journal of Xiangtan Normal University(Social Science Edition)*, No.5, 179-181(2009)
4. Y. Liu, Based on the self update effective English classroom teaching and research, *Journal of Hunan University of Science & Technology(Social Science Edition)*, No.4,137-140(2010)
5. C. X. Zhu, Give full play to the teaching enthusiasm to improve the quality of undergraduate teaching, *China University Teaching*, No.3,50-51(2014)
6. Y. H. Gao, W. L. Huang, J. Liu, University teachers' talent competence quality factor model empirical research, *Journal of Hunan University of Science & Technology(Social Science Edition)*, No.5,79-83(2011)
7. X. H. Wang, F. H. Huang, J. Liu, The teaching quality evaluation model based on BP neural network and its application, *Research in Higher Education of Engineering*, No.5,78-81(2007)
8. Q. D. Wang, H. J. Hou, J. Liu, Based on interval number variable weight principle of teaching quality evaluation model, *Systems Engineering-Theory & Practice*, Vol.28, No.3,151(2013)