

Research Article

The Application of Connotative Teaching in Private Colleges Based on Kano Model

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Connotative development of higher education is of great significance in China. To promote this endeavor, this paper has established a connotative teaching system based on the Kano model and has applied it in the teaching of statistics. Guided by the fundamental demands of students, this system is built from the four perspectives, including students, third-party evaluation institutions, schools, and morality and law. It also takes the advantages of the Kano model, featuring the three dimensions of essential demand quality, expected demand quality, and charismatic demand quality. The paper also describes a two-year experiment to test the effect of the Kano-model-based connotative teaching system. It has collected more than 200 effective samples and compared the performance of students in private colleges. The results are as follows: the connotative teaching of statistics guided by the Kano model can meet the demands of students in private colleges and improve their comprehensive scores. This model shows remarkable performance and will promote the reform on connotative teaching.

1. Introduction

1.1. Research Status. As the most suitable way for higher education in China, connotative development and teaching have become hotspots of current educational research. There are mainly three directions in domestic research. The first is to study the essence, characteristics, key points, and trend of connotative education from different backgrounds. Related references include the study of Xu Jihong (2020) on the connotative development of local colleges and universities under the “double first-class” background. The second is to study the system of connotative development in colleges and universities. Related references include the study of Mei Guoping (2021) on the “five retreats and five establishments” to promote the connotative development of local undergraduate education. The third is to explore the teacher evaluation system that is oriented to connotative education. The related references include the proposal by Wang Yi (2021) on new indicators of connotative development [1–6]. However, most domestic studies focus on theoretical discussion.

Besides the design of the teaching model based on teachers' own charm, foreign studies on connotative education also pay attention to the connotative education of private and public universities and their different educational objects. For example, Ivánková studied the changes in connotative perception of notions from the area of science education [7]. Most of these studies stress practical and specific aspects, such as the design of teaching interaction, strategies, environment, evaluation, tools, and resources.

1.2. Research Significance and Content. Connotative teaching is a concept that values educational results. The key of connotative teaching lies in how to use scientific methods to make students have a sense of gain and improvement. Therefore, research on connotative teaching will contribute to teaching quality and education. Based on contemporary university educational studies, a targeted connotative teaching model is proposed with practical application to promote the connotative development of education. This paper uses results from the Kano model to design the

connotative teaching mode and applies it to students of statistics. Its aim is to encourage more classroom participation of college students and offer them with better learning experience. This study also strives to be a reference for future applied research in connotative teaching.

Based on the Kano model, this paper designs a connotative teaching model based on the “Applied Statistics” course. On the basis of the connotative teaching mode, the connotative teaching mode is applied to the economic management students in private colleges and universities. After two years of experiments, the connotative teaching mode is verified, and good results are obtained.

2. Design Basis of Kano-Based Connotative Education Model for Applied Statistics Students

2.1. About the Kano Model. Inspired by the two-factor theory (also known as Herzberg’s motivation-hygiene theory), Noriaki Kano, a professor at Tokyo University of Science in Japan, believed that it is useful to classify and prioritize users’ demands. Based on the analysis of users’ demand and satisfaction, he proposed a nonlinear relationship between product performance and users’ satisfaction. This relationship model is known as the Kano model [8]. The Kano model is widely used in multi-disciplinary fields for large-scale user demand survey, such as the disclosure of government information, website information management, and medical needs. Moreover, the Kano model is applied to better understand customer demands in higher education [9–13], serving as an analyzing tool to find different demands of users.

The Kano model is adept to convert implicit characteristics of service quality to explicit ones. Considering that functional requirements will affect users’ satisfaction, the Kano model divides demands into essential demand, one-dimensional demand, charismatic demand, implicit demand, and reverse demand [14, 15]. For the validity of evaluation indicators in connotative teaching reform, it is necessary to investigate the satisfaction of college students, further identify the expectation types of various indicators, and determine the priority of different features in the reform. Thus, the Kano model is a suitable tool for the analysis. Essential demand emphasizes basic requirements from college students that must be met in their daily study and life. This is the most direct goal of teaching; otherwise, college students will be dissatisfied to a great extent. As for expected demand, college students’ satisfaction with teaching increases as such demand is satisfied. The better the expected demands are met, the higher the satisfaction college students will get. If expected demands are not met, college students will gradually become dissatisfied. Charismatic demand is a type that most college students do not expect to be met. Once this demand is met, the satisfaction of college students will significantly increase [16–18]. Neutral demand has no significant impact on college students’ satisfaction, whether such demands are satisfied or not. Reverse demand is the one that will lead to the dissatisfaction among college students

when provided and may adversely affect product or service quality.

2.2. Application Basis of the Kano Model in This Paper. The application of the Kano model in education helps to find the real needs of students as the center and helps to further improve the quality of education. Therefore, based on the Kano model, this paper constructs a “student-centered” teaching evaluation system. This system measures from the perspectives of students, schools (academic affairs offices), third-party evaluation institutions (supervision committees), and morality and law. Under the guidance of connotative design and result-oriented principles, the previous single-dimensional evaluation system has been converted to a comprehensive one with four parties. This joint evaluation system consists of students, third-party evaluation institutions, schools, morality, and law. It highlights students’ subject status and focuses on talent skills required by employers.

3. Design of Connotative Teaching Mode of Applied Statistics Based on the Kano Model

3.1. Basic Framework of Connotative Teaching Evaluation System for Applied Statistics. Based on Kano’s perspective and guided by the fundamental demands of students, this paper builds a comprehensive evaluation system consisting of students, third-party evaluation institutions, schools, morality, and law. This four-dimensional system aims to improve the teaching quality, and Figure 1 shows the details.

3.2. Design of Connotative Teaching Quality Evaluation System for Applied Statistics Based on the Kano Model. Based on the Kano model, this paper constructs a five-in-one and result-oriented connotative education evaluation model. The model is from the perspectives of students, schools (academic affairs offices), third-party evaluation institutions (supervision committees), and morality and law. The detailed deployments are as follows.

3.2.1. Student-Based Evaluation Indicator of Teaching Quality. Students are recipients of education and the center of all teaching activities. To improve the overall teaching quality, “education should be oriented to undergraduate course.” Therefore, it is necessary to establish a student-oriented and result-oriented teaching model. Furthermore, the model should combine teaching objectives, requirements, assessment scheme, and results through investigation and analysis. In this way, the essential, expected, and charismatic teaching indicators can be identified. The design of the connotative teaching model should be based on students’ demands. The model proposed by this paper aims to provide college students with highly participatory and personalized learning experience and offers a reference for the application research in connotative teaching.

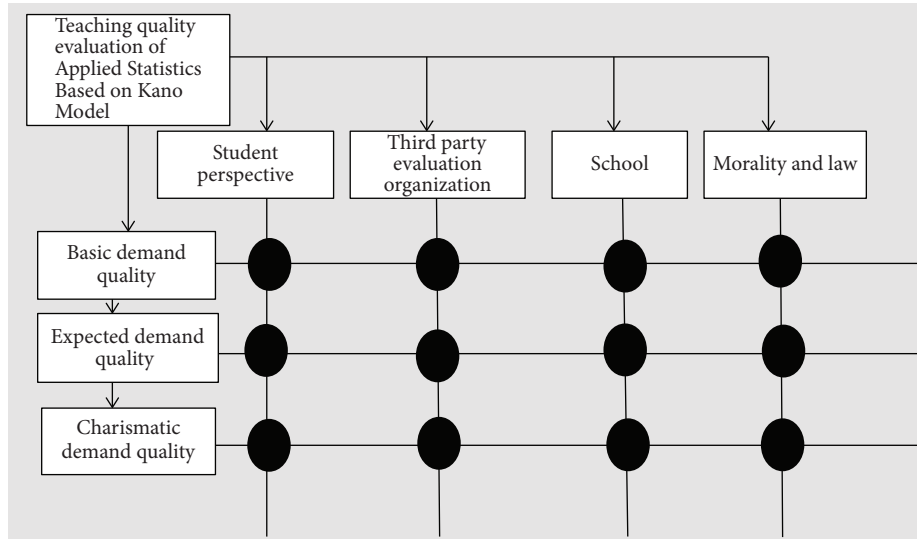


FIGURE 1: The teaching quality evaluation system based on the Kano model.

3.2.2. Evaluation Indicator of Teaching Quality from the Perspective of Third-Party Organizations (Supervision Committees). The third-party evaluation organization is a supervision committee formed by experienced teachers hired by the school. The committee oversees the teaching quality based on its members' experience and expertise. Therefore, this paper establishes the evaluation indicator of teaching quality from the perspective of the supervision committee. It covers the project-based teaching, flipped classroom, online and offline teaching, and other teaching modes. The evaluation system will measure course design, teaching arrangement, and presentation of teachers to see if they present courses efficiently in their classrooms. Moreover, the committee will check whether the selection and design of teaching content meet the teaching objectives and are result-oriented. The evaluation system also oversees if the courses are thought-provoking and challenging for students; whether the teacher provides a vivid, clear, and logical presentation of knowledge; and whether a teacher can accurately choose teaching strategies to overcome problems. Other indicators include the use of resources related to teaching content and the achievement of teaching objectives. All these measurements are used to identify the essential, expected, and charismatic teaching indicators and explore the core of connotative education.

3.2.3. School-Based Evaluation Indicator of Teaching Quality (Academic Affairs Offices). Traditional teaching method focuses more on students' acquisition of knowledge and examination results, while the reformed one pays more attention to their sense of gain. The school-based evaluation indicator reflects the teaching quality through the investigation of teaching mode, design, strategy, methods, resource utilization, and teaching effects. In this way, the essential, expected, and charismatic teaching indicators can be identified, so as to improve the ultimate teaching efficiency and to explore the core of connotative education.

3.2.4. Evaluation Indicator of Teaching Quality Based on Morality and Law. Helping students acquire virtues or moral habits is the foundation of education. The essential of education is to educate students to be a kind, honest, and civilized person. The evaluation indicator of teaching quality based on morality and law values courses that combine knowledge with ideological and political elements. It checks whether the teacher can help students establish scientific concepts and a sense of justice and encourages hard work, perseverance, seeking the truth, and dedication. From this perspective, the evaluation system values those who aim to cultivate "person with four virtues," which ensures youngsters to have ideals, morality, knowledge, and discipline. In this way, the essential, expected, and charismatic teaching indicators can be identified to explore the real connotation of education.

4. Application of Connotative Teaching Reform Based on the Kano Model in the Classroom of Applied Statistics

The teaching quality evaluation system designed according to the Kano model in Section 3 is applied to the course of applied statistics in a private university. The subject of this experiment is the first semester of the 2021-2022 academic year. The subjects of the experiment are the 2019 students of economic management in a private university. The control group of this experiment is the university where the experimental group is located in the 2020-2021 academic year. The control group of this experiment is the 2018 class of economic management students. To ensure fairness and justice of the experimental results and build the same experimental environment as much as possible, this experiment lasted for two years. The experimental objects are students from two different academic years in the same private college. All the experimental objects are undergraduate students majoring in economic management. The

original sample data are 210. However, due to individual reasons and the COVID-19 pandemic, 6 people did not take the exam. As their comprehensive scores are absent, their samples are removed from the database as invalid samples. Therefore, the effective data are 204, with an effective rate of 97.14%, meeting the requirements on the sample number.

4.1. *The Experiment Basis of Connotative Teaching Reform on Applied Statistics under the Kano Model*

4.1.1. *The Process of Connotative Teaching under the Kano Model.* Based on students' demands, the experiment runs through the whole connotative teaching mode, with the process as follows.

As can be seen from Figure 2, the transformation of students' needs is divided into three stages.

The first stage is to meet students' essential needs (i.e., basic needs). At this stage, teachers make corresponding curriculum design and teaching scheme design on the basis of understanding students' learning situation and mastering students' basic needs.

The second stage is the transformation from meeting students' essential needs (i.e., basic needs) to meeting students' expected needs. This stage is based on the basic needs of students and the principle of morality and law first. Teachers teach courses according to the needs of students, accept the supervision and requirements of the Academic Affairs Office of the school at any time, and complete the teaching process according to the suggestions of the third-party evaluation organization (Supervision Office). At this stage, there are hidden needs, such as the impact of schools and third-party evaluation institutions on teachers' teaching process and the influence of law and morality on teachers' teaching process.

The third stage is the transformation from meeting students' expectation needs to meeting students' charm. According to the charm demand of students, it is comprehensive, reflecting the principle of omni-directional and multi-angle and the sum of the percentage of students' comprehensive performance since the last semester and the percentage of final examination results. Students' final scores are also the results obtained before and after the experiment, and the final result is shown in detail in Figure 3.

4.1.2. *Basic Analysis of Connotative Teaching of Applied Statistics from the Perspective of Kano.* To evaluate connotative teaching in applied statistics, an indicator system is designed from Kano's perspective. To test its effects, a questionnaire survey has been carried out in the experimental class. The survey includes four experimental classes with full participation. The number of students in this survey is an experimental class, with a total of 4 classes and a sample size of 124. The subjects of this experiment are exactly the same as the subjects of the previous questionnaire survey, so it is persuasive. The Cronbach coefficient is used to verify the recognition, satisfaction, and reliability of the data, which is 0.806. The validity analysis results are as follows (Table 1).

Among them, students' cognition of applied statistics is shown in Figure 3.

According to Figure 3, 87.01% of the students can get the basic concepts of statistics. This indicates that most students have the cognition about statistics.

As a basic discipline, the impact of statistics to students is as follows.

According to Figure 4, 89.61% of students believe that statistics promote the development of laws, and 77.92% of students believe that statistics provide scientific solution to research problems.

As for how to improve interests in learning statistics, students' choice are as follows.

According to Figure 5, 85.06% of the students believe that cases in life will help provoke their interests in learning statistics, and few people like exams.

As for motivations that promote further learning, the results are as follows.

According to Figure 6, the pursuit of rational life is the most popular motivation for students to learn statistics, accounting for 62.34%.

After analyzing the students' learning situation, the teacher adds more innovative methods, such as project-based teaching, flipped classroom, and situational teaching in the traditional theoretical teaching. The newly designed teaching scheme and process are expected to have better teaching effect.

4.2. *Comparison of the Experimental Results from the Kano-Model-Based Connotative Teaching Reform on Applied Statistics.* The experiment studies the connotative teaching reform of applied statistics from the perspective of the Kano model. It adopts the same assessment method for both the control group and the experimental group. There are two classes in the control group with 80 samples and four classes in the experimental group with 124 samples in total. The control group has not used the Kano model in the design of connotative teaching scheme. In comparison, the experimental group uses the Kano model and includes two normal classes and two upgraded classes. The results are as follows.

According to the data above, the following points can be obtained:

- (1) The results indicate that the experiment is effective and can better reflect the teaching process based on students' demand. According to Figures 7 and 8, the average scores of the four classes in the experimental group are higher than 70, and the those of the two classes in the control group are much lower. The Kano-model-based connotative teaching scheme for applied statistics has much better effects than traditional teaching.
- (2) The Kano-model-based connotative teaching is worth popularizing in courses of applied statistics. Among the four teaching classes receiving connotative teaching, two are normal classes and two are upgraded classes. The above figures show that although the classes are of different types, their average

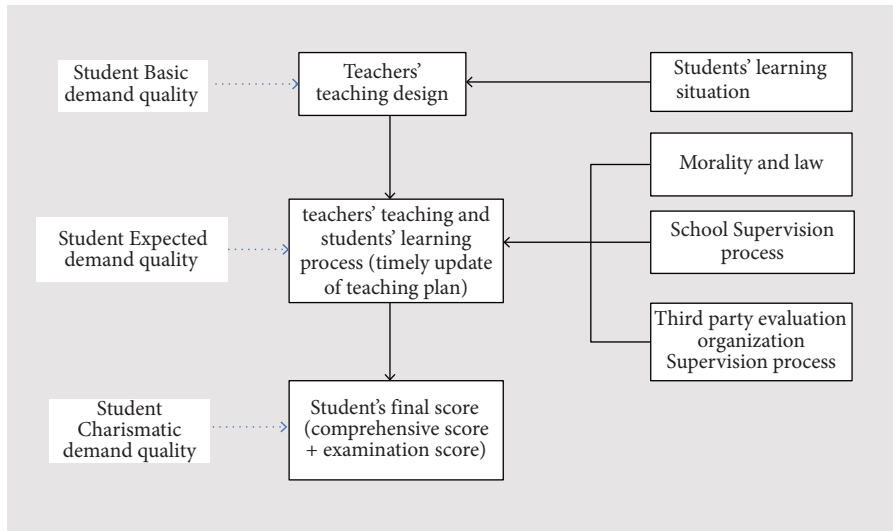


FIGURE 2: Connotative teaching reform under the Kano Model.

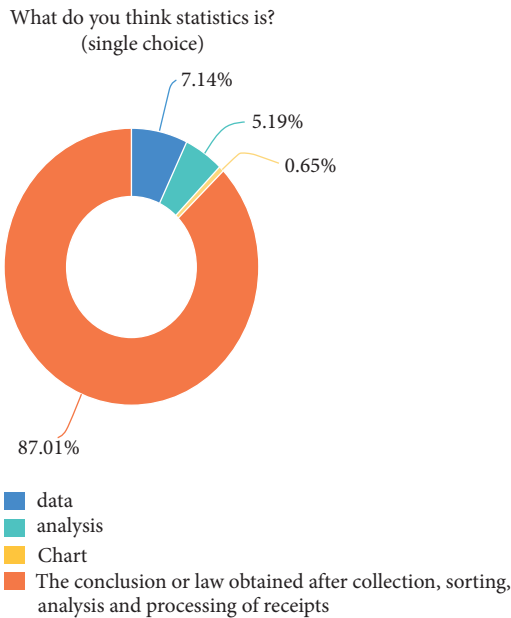


FIGURE 3: Statistical cognition survey results.

TABLE 1: Reliability of factors.

Project	Factor	Common degree
Familiarity with statistics	0.77	0.595
Satisfaction about statistics	0.9	0.814
Interests in learning	0.87	0.754

The data are proved to be both reliable and valid for use.

scores are all higher than 70 and are better than those of the control group. These results prove from another perspective that the Kano-model-based connotative teaching can be well applied in statistics education.

- (3) As the Kano model is result-oriented, the connotative teaching using this model can meet the higher

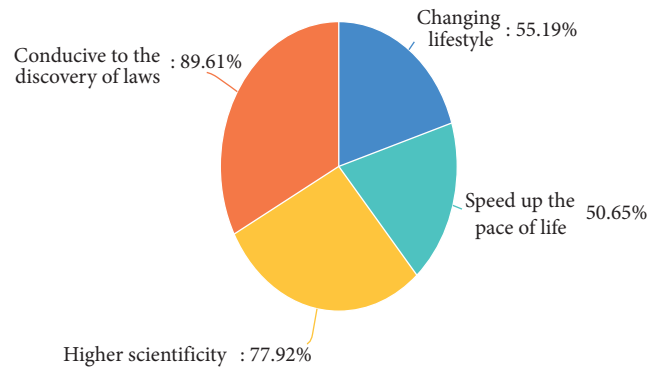


FIGURE 4: Survey results of statistical impact.

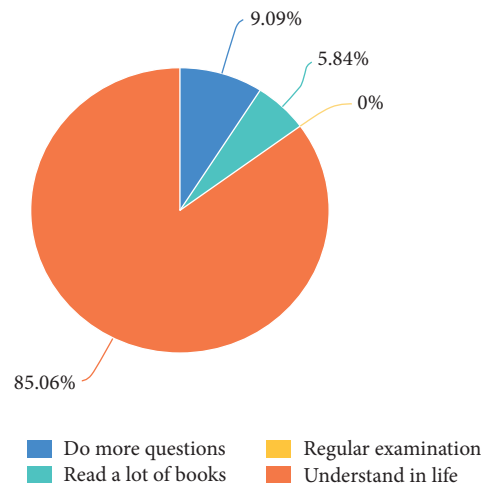


FIGURE 5: Survey results of increasing interests in statistics.

demands of students than the traditional teaching. From the essential demand quality, expected demand quality, to the charismatic demand quality, this teaching method generates a win-win result, satisfying the expectation of all parties.

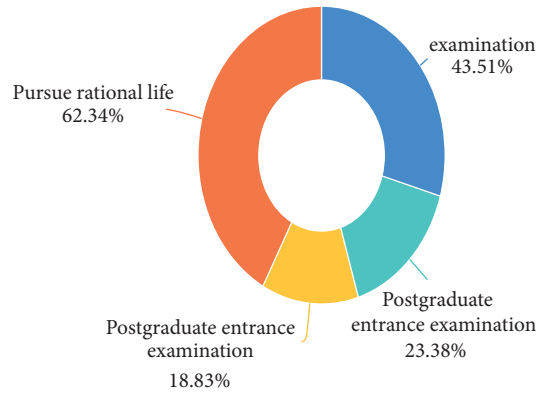


FIGURE 6: Survey results of motivation for further learning.

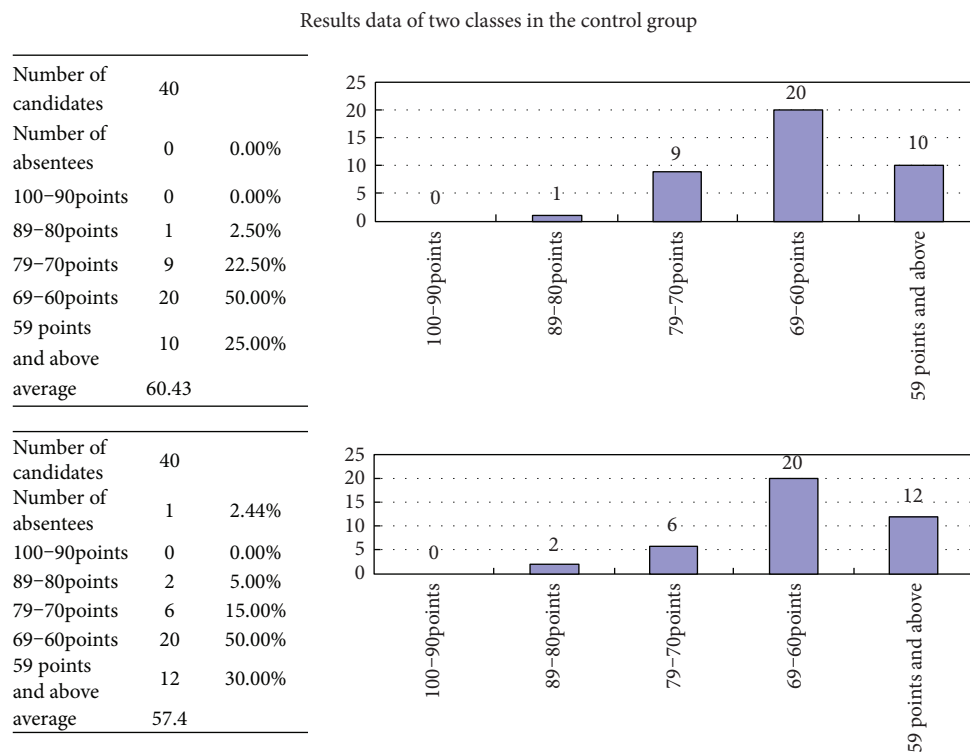


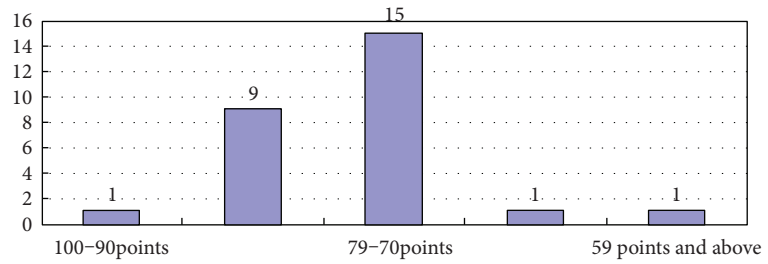
FIGURE 7: Results obtained from the control group.

(4) From the figures above, it can be seen that the Kano model is suitable for connotative teaching. Moreover, a quality evaluation indicator system has been built to measure the teaching effects. This system is constructed from four dimensions, including students, third-party

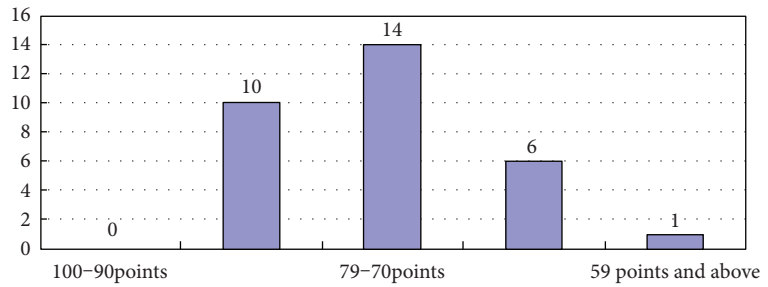
evaluation institutions, schools, and morality and law. After it is used in applied statistics courses, it is proved to be effective in the design of teaching methods based on essential demand quality, expected demand quality, and charismatic demand quality.

Results data of four classes in the experimental group

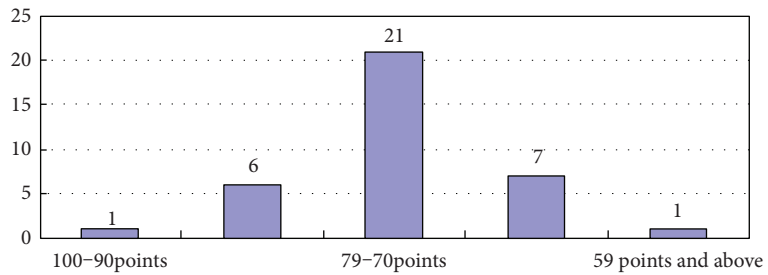
Number of candidates	27	
Number of absentees	0	0.00%
100-90points	1	3.70%
89-80points	9	33.33%
79-70points	15	55.56%
69-60points	1	3.70%
59 points and above	1	3.70%
average	76.48	



Number of candidates	31	
Number of absentees	0	0.00%
100-90points	0	0.00%
89-80points	10	32.26%
79-70points	14	45.16%
69-60points	6	19.35%
59 points and above	1	3.23%
average	75.26	



Number of candidates	36	
Number of absentees	0	0.00%
100-90points	1	2.78%
89-80points	6	16.67%
79-70points	21	58.33%
69-60points	7	19.44%
59 points and above	1	2.78%
average	74.53	



Number of candidates	30	
Number of absentees	0	0.00%
100-90points	1	3.33%
89-80points	12	40.00%
79-70points	8	26.67%
69-60points	3	10.00%
59 points and above	6	20.00%
average	73.27	

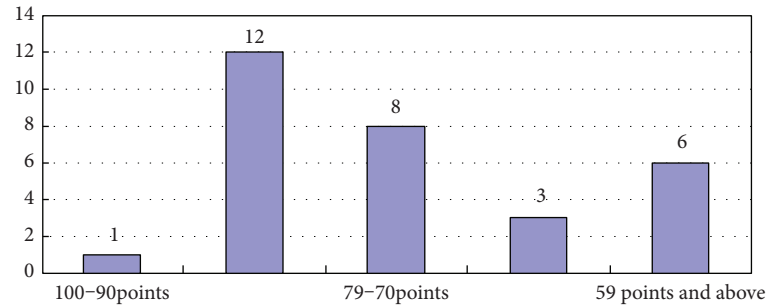


FIGURE 8: Results obtained from the experimental group.

5. Conclusion and Prospect

5.1. *Research Conclusion.* Connotative education plays an important role in China. Private colleges have shorter history than public colleges and universities, and it is their major task or even a way for survival to transform from traditional teaching to connotative development. In other words, it is more urgent but difficult for private colleges and universities to turn to connotative teaching, which values students' demands and is more result-oriented. Therefore, this paper has designed a connotative teaching evaluation indicator system and applied it in the courses of applied statistics. This system is based on the Kano model and features four dimensions, namely, students,

third-party evaluation institutions, schools, and morality and law. The Kano model usually adopts three aspects of essential demand quality, expected demand quality, and charismatic demand quality. With the help of the Kano model, the system can greatly contribute to practical teaching. This paper conducted related experiments and obtained good results. Thus, the promotion of connotative teaching in courses of applied statistics has practical significance.

5.2. *Research Prospect.* From the perspective of Kano, this paper puts forward a connotative teaching scheme for applied statistics education. The scheme adopts four

dimensions and three aspects, hoping to be applied in practice (engineering students and public universities). In this way, practical results can be obtained and further development of connotative teaching can be realized. Based on their own learning experiences, colleges and universities can design tailor-made schemes from different perspectives and conditions with more participation. This paper aims to provide a frame of reference for researchers dedicated to the application of connotative teaching.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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