Exploration of Chinese Architectural History Course Teaching Based on Multi-Dimensional Model

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Abstract: With the continuous renewal of educational ideas, the traditional teaching mode is facing the need of reform. As a new teaching strategy, multi-dimensional teaching mode aims to improve students' learning efficiency, effectiveness and satisfaction by integrating various teaching methods and resources. This study aims to explore the application of multi-dimensional model in Chinese architectural history curriculum and compare it with traditional teaching methods and independent learning. This study adopts the method of comparative experiment, and selectes 12 students from three different teaching groups: multi-dimensional teaching mode, traditional teaching method and independent learning. This paper collects data on learning efficiency, learning effectiveness, and course satisfaction through standardized tests, questionnaires, and student feedback. The experimental results were compared by statistical analysis to evaluate the effects of different teaching modes. Experimental data show that multi-dimensional teaching is superior to traditional teaching methods and independent learning in improving students' learning efficiency, effectiveness and satisfaction. Students in multidimensional mode can achieve up to 96% learning efficiency, up to 93 learning scores, and 9.1 course satisfaction. Through the combination of case analysis, group discussion, field trips and other diversified teaching activities, it effectively stimulates students' learning interest and participation, and promotes their all-round development. Therefore, it is suggested that educators should consider introducing multi-dimensional teaching mode in curriculum design to improve teaching quality and students' learning experience. At the same time, for independent learning and traditional teaching methods, corresponding support and improvement measures should be provided to meet the learning needs of different students.

1. Introduction

The field of education is undergoing unprecedented changes driven by informatization and globalization. The traditional teaching mode, especially the teacher-centered teaching method, is gradually considered to be unable to meet the diverse learning needs of students. As an innovative teaching strategy, multi-dimensional teaching aims to improve students' learning efficiency,

effectiveness and satisfaction by integrating different teaching methods, resources and environments. Chinese architectural history is a comprehensive subject involving history, culture, art and technology. The complexity and depth of its teaching content require teaching methods that can adapt to students' different learning styles. Therefore, it is of great significance to explore the application of multi-dimensional model in the course of Chinese architectural history for improving teaching quality and students' learning experience.

This study systematically analyzes the effects of multi-dimensional teaching in Chinese architectural history curriculum and compares it with traditional teaching methods and independent learning. The research results not only provide empirical support for the application of multi-dimensional model teaching in the course of Chinese architectural history, but also provide a reference for the teaching model reform of other disciplines.

This paper first introduces the research background and theoretical basis of multi-dimensional model teaching, and describes the research methods including experimental design, data collection and analysis process in detail. Then, this paper presents and analyzes the experimental results, and compares the differences between multidimensional teaching and other teaching methods in learning efficiency, learning effectiveness and course satisfaction. Finally, this paper puts forward conclusions and suggestions based on the research results, and discusses the limitations and future research directions of the study. The article also includes an in-depth discussion on the application of multi-dimensional model teaching in the course of Chinese architectural history, as well as enlightenment to educational practice.

2. Related Work

In today's education field, the continuous progress of technology and the rapid changes of society make the teaching methods and curriculum content are constantly developing and reforming. In the course teaching of "Chinese Architectural History", Dai Meina selected part of the class hours to add chapters on regional architectural culture based on the existing knowledge system, and introduced the concept of "mixed teaching mode" to carry out curriculum reform practice [1]. Zheng Yiqiao had brought great changes to teaching based on network information technology, and the history of Chinese and foreign architecture was an important basic course for architecture related majors. She had made full use of the opportunities brought by information technology and the mixed teaching mode of online and offline to form a vivid classroom that could trigger multi-dimensional perception [2]. Through the course analysis of "History of Chinese and Foreign Architecture", Yuan Xinhua constructed the course ideological and political teaching system from the aspects of condensing the "one core, one main line and three steps" course ideological and political objectives, mining the course ideological and political elements with "height, depth and temperature", reconstructing the modular course ideological and political teaching content system, innovating the course ideological and political teaching mode, and optimizing the course evaluation mechanism [3]. By discussing and studying the multi-dimensional model and taking the current school-enterprise collaborative education practice as an example, Xiang Jun put forward suggestions on the mode and practical development of school-enterprise collaborative education, further improving the characteristic education mechanism of higher vocational colleges and cultivating high-quality vocational talents [4]. Yan Xixi started with the development status of cyberspace security discipline in teaching practice, took new engineering as the construction background and integrated existing teaching resources, and proposed to establish a multi-dimensional linkage training model for four integrated talents with the aim of cultivating high-level professionals in the field of cyberspace security [5].

In addition, Chen X proposed a Bayesian Time Factor Decomposition framework, which was

used to model multidimensional time series (especially spatio-temporal data) in the absence of values [6]. Richards J C explored various emotions experienced by teachers and students, the reasons for these emotions, and their impact on teaching and learning [7]. Baroudi S investigated teachers' self-efficacy in an online learning environment for COVID-19. Quantitative and qualitative data showed that online teaching had a higher sense of self-efficacy [8]. Stewart W H integrated the results of 38 empirical studies on Educational Readiness Training (ERT) in higher education fields around the world in 2020 and discussed the open research field on the long-term impact of ERT [9]. Churi P implemented new teaching and assessment practices through rigorous literature research, and read high-quality papers and articles to achieve effective teaching [10].

Although the above studies have made important contributions in the field of education, there are still some shortcomings. First, many studies have not fully taken into account the individual differences and different learning styles of students, which may affect teaching effectiveness and students' learning experience. Based on these shortcomings, this paper will explore the teaching of Chinese architectural history based on multi-dimensional model. Based on the above research, the research of this paper will deeply analyze the characteristics and students' needs of Chinese architectural history curriculum, try to design a more personalized and interactive teaching method, and explore how to better integrate curriculum elements into the teaching process.

3. Method

3.1 Data Collection and Analysis

In the teaching exploration of Chinese architectural history based on multi-dimensional model, the process of data collection and analysis is crucial [11-12]. This process involves not only the collection of historical building data, but also the evaluation of student learning behaviors and outcomes. The purpose of data collection is to gather enough information to construct a multi-dimensional perspective in teaching. This includes: gathering information about the building's age, style, structural features, geographical location, etc. For example, for an ancient building, the study may need to record its construction year, architectural style, and major structural parameters such as length, width, and height, and collect students' learning progress, understanding, and points of interest through questionnaires, tests, and assignments. In this study, a simple weighted average score can be used to assess students' mastery of specific architectural knowledge points, as shown in Table 1.

Table 1 records the students' ids, names, architectural knowledge points they learned, test scores, homework completion, class participation, field trip feedback, learning interests, learning difficulties and their suggestions for course improvement. These data can help teachers understand how students are learning and adjust teaching plans and methods based on this information.

Data analysis aims to extract valuable information from the collected data and use it to guide teaching practices.

For missing values, the linear interpolation method is used to estimate these values. Linear interpolation is based on the known data points by constructing a linear equation to predict the missing data points.

Data integration is to combine data sets from different sources into a unified data set. For example, this study could combine building historical data (e.g., age, style, structural features) with student learning data (e.g., grades, engagement, feedback). Such data fusion is helpful for this study to analyze students' learning situation and their understanding of specific architectural knowledge points from a multi-dimensional perspective.

Table 1: Teaching data table of architectural history course

Student ID	Architectural Knowledge Point	Test Score	Homework Completion	Class Participation (1-5)	Field Trip Feedback	Learning Interest (1-5)	Learning Difficulty	Suggestions for Improvement
001	Tang Dynasty Architecture	85	90%	4	Good	4	Roof Structure	Group Discussion
002	Song Dynasty Architecture	78	80%	3	Average	3	Bracket System	Video Assistance
003	Ming and Qing Dynasties Architecture	92	85%	4	Excellent	2	Wooden Structure	Physical Models
004	Yuan Dynasty Architecture	72	75%	2	Fair	3	Tile Work	Interactive Lectures
005	Qing Dynasty Palaces	88	95%	5	Very Good	4	Garden Design	More Visual Aids
006	Modern Chinese Architecture	90	100%	4	Excellent	3	Structural Systems	Case Studies
007	Traditional Chinese Gardens	83	82%	3	Good	4	Water Features	Field Workshops
008	Urban Planning in Ancient China	80	78%	3	Good	3	City Walls	Virtual Tours

To help teachers and students understand these complex data, this study uses data visualization tools. Scatter plots can be used to show students' performance in different architectural knowledge points. Through the scatterplot, this study can intuitively see the average level of students in a certain knowledge point and how their individual performance is distributed.

In the stage of statistical analysis, this study uses correlation analysis to study the relationship between students' learning behavior and achievement. The correlation coefficient measures the strength of the linear relationship between two variables. By calculating coefficients, this study can understand whether students' investment in specific learning activities (e.g. participating in discussions, completing assignments) is significantly correlated with their learning outcomes (e.g. test scores).

In pattern recognition, this study uses clustering analysis and other algorithms to identify the typical patterns of students' learning behavior. For example, the K-means algorithm could help this study divide students into several groups, each with similar learning behavior characteristics. This helps this study to understand the learning characteristics of different student groups, so as to provide them with more personalized teaching support.

Through these data collection and analysis steps, teachers can better understand students' learning needs, optimize teaching content and methods, and improve the teaching effect of Chinese architectural history course. At the same time, these analysis results also help teachers in curriculum design and evaluation to ensure that teaching activities can effectively support students' learning goals.

3.2 Design Principle and Framework of Multi-Dimensional Mode

Multi-dimensional architectural history teaching emphasizes presenting teaching content from

multiple perspectives to provide a comprehensive learning perspective [13-14]. This multi-dimensionality is not only reflected in the analysis of the building itself, such as historical period, architectural style, geographical distribution and socio-cultural context, but also in the diversity of teaching methods, such as through lectures, seminars, group projects and field trips, to adapt to the learning styles of different students. At the same time, interactivity is another key design principle, which encourages students to actively participate in the teaching process, improving the initiative and depth of learning through discussion and research. The use of visual tools such as images, diagrams and three-dimensional models helps students better understand and remember complex architectural concepts. Through case studies and field trips, contextualized teaching places students in actual historical and cultural situations to enhance the sense of reality and application of learning. The development of personalized learning paths and resources to meet the learning needs of different students is also an important part of multi-dimensional teaching model [15-16].

In terms of designing the framework, this study first sets clear curriculum objectives and defines the standards that students should achieve in terms of knowledge mastery, skill development and attitude formation. Then, this study organizes the course content and arranges it structurally according to the time line, regional characteristics, architectural style and other dimensions. The teaching activities are designed to stimulate students' interest and engagement through different teaching methods. The development and integration of resources include textbooks, online courses, multimedia materials and expert lectures, etc., to provide students with rich learning materials. The establishment of evaluation and feedback mechanism includes formative evaluation and summative evaluation, as well as timely feedback to ensure the realization of teaching objectives. Finally, according to the students' learning results and feedback, this research constantly adjusts and optimizes the teaching content, methods and resources to achieve continuous improvement of teaching.

Through this multi-dimensional design principle and framework, the Chinese architectural history course can provide students with a comprehensive, interactive and personalized learning environment, which not only improves the teaching effect, but also stimulates students' learning interest and cultivates their critical thinking and innovation ability [17-18]. The implementation of this teaching mode will help students to have a deeper understanding of the rich connotation of Chinese architectural history, and also provide a flexible and dynamic teaching platform for teachers.

3.3 Application Method and Teaching Process

In the application of multi-dimensional teaching mode in the course of Chinese architectural history, it is necessary to first set clear course objectives to ensure that students can fully understand the development process of Chinese architecture and the cultural significance behind it [19-20]. Next, teachers need to integrate the course content, divide the history of architecture into different dimensions, such as classifying it according to historical period, style characteristics and geographical distribution, and combine the interdisciplinary knowledge of art, geography and sociology to enrich the teaching content. In terms of teaching methods, various means should be adopted, such as lectures, discussions, case studies, field trips, etc. At the same time, students should be encouraged to participate actively, and their interest and participation should be enhanced through group cooperation and role playing. When designing learning activities, students should consider exploring the history of architecture from multiple perspectives, such as analyzing the architectural characteristics of different dynasties to understand the impact of historical changes, or comparing the architectural styles of different regions to explore the geographical and socio-cultural

influences. When assessing student learning outcomes, a variety of assessments should be used, such as written exams, oral reports, project assignments, etc., and timely feedback should be provided. Finally, teachers should regularly reflect on the teaching effect and adjust the teaching content and methods according to the feedback in order to better achieve the teaching objectives. Through this teaching process, students not only gain knowledge, but also develop analytical and critical thinking skills.

4. Results and Discussion

Self-directed learning emphasizes student initiative and self-drive, which allows students to explore learning material according to their own interests and pace. Traditional teaching methods, such as lecturing, are usually teacher-centered and emphasize the transfer and memory of knowledge. When exploring the teaching of Chinese architectural history based on multi-dimensional model, this study can evaluate its effect by comparing different teaching methods. This comparison will focus on the performance of independent learning, traditional teaching methods and multi-dimensional teaching strategies in improving learning efficiency, learning effectiveness and students' course satisfaction. Through this comparison, this study can better understand the advantages and limitations of each approach, thus providing guidance for teaching practice. To fully evaluate these teaching methods, this study required the design and implementation of a range of assessment tools and activities, including but not limited to questionnaires, learning outcomes tests, and student feedback sessions. Through these evaluations, this study can quantify the performance of each teaching method on the above evaluation indicators, so as to provide data support and improvement suggestions for teaching practice. In this study, 12 students were selected to conduct comparative experiments on their learning efficiency, learning effectiveness and course satisfaction under different teaching methods and record the final results.

4.1 Learning Efficiency

High learning efficiency means that students are able to achieve learning goals in a shorter period of time, which not only saves teaching resources, but also provides more time for students to explore other interests or pursue in-depth learning. The comparison results of learning efficiency are shown in Figure 1:
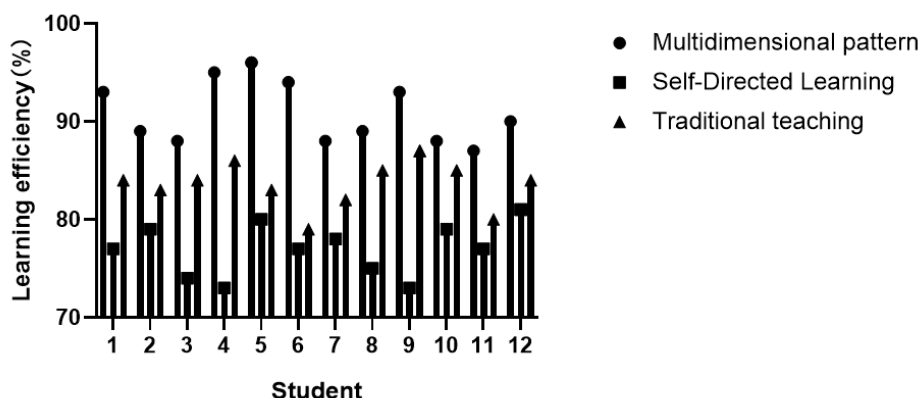

Figure 1: Comparison of learning efficiency

As can be seen from the learning efficiency data in Figure 1, the learning efficiency of students in multi-dimensional mode can reach 96% at the highest and 87% at the lowest, while that of traditional teaching methods is only 87% at the highest and that of independent learning is only 81%

at the worst. This shows that the multi-dimensional model can effectively promote students to master more knowledge in a shorter time and be able to understand and apply what they have learned more deeply. However, traditional teaching methods rely too much on teaching and memorization, and not enough on students' active participation and practical operation. Independent learning requires high self-management ability and learning strategy of students, and some students may lack these abilities, resulting in low learning efficiency.

4.2 Learning Effectiveness

Learning effectiveness reflects the degree of mastery of architectural history knowledge by students at the end of the course, and the study is assessed by the final scores obtained in the examination. The final exam results of 12 students are shown in Figure 2:
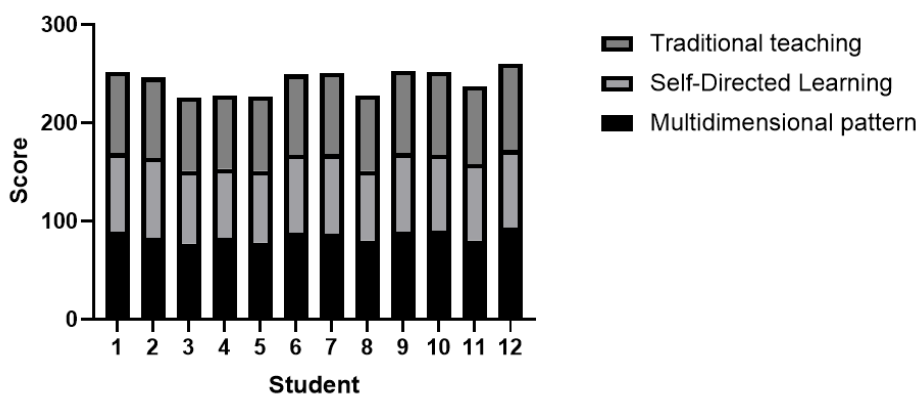
Figure 2: Comparison of learning effectiveness

As can be seen in Figure 2, the score of the first student can reach 89 under the multi-dimensional teaching mode, but the score obtained by independent learning is only 80, and the score can reach 83 under the traditional teaching method. Similarly, among other students, the score of multi-dimensional teaching mode is higher than the other two methods, the highest score of multi-dimensional teaching mode is 93, while the highest score of independent learning and traditional teaching method is 81 and 85, respectively. This result suggests that the multi-dimensional teaching model can more effectively promote students' understanding and application of knowledge, resulting in higher scores in the assessment.

4.3 Course Satisfaction

Students' satisfaction with teaching content, teaching method and overall learning experience can be expressed by course satisfaction, which can reflect the degree of acceptance among students. Through this comparative experiment, we can reveal which teaching mode is more able to stimulate students' learning enthusiasm, enhance their learning experience, and ultimately improve their course satisfaction. This not only has guiding significance to educational practice, but also has important value to improve the quality of education and promote the all-round development of students.

As can be seen from the data in Figure 3, the satisfaction of multidimensional teaching is basically above 8, and only one student scored 7.8, but the highest score reached 9.1. The independent learning methods all scored below 8, with a minimum of 6.8, while the traditional teaching methods scored up to 8.5. This shows that multi-dimensional teaching mode is widely welcomed by students, and students highly approve of this teaching mode, while the other two

methods cannot meet the diversified learning needs of students and improve their learning experience.
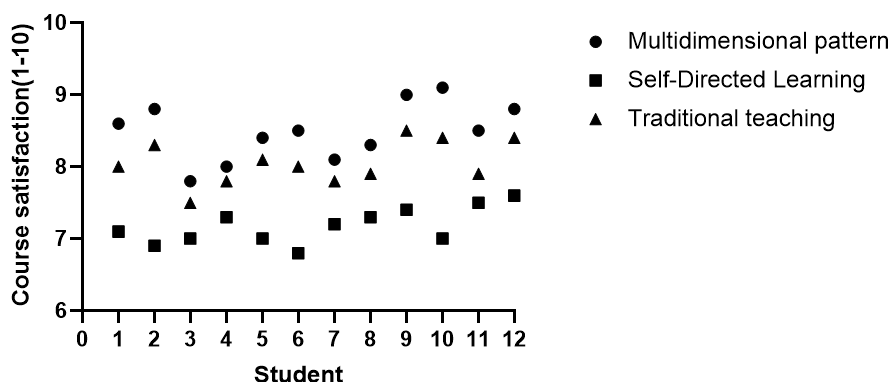

Figure 3: Comparison of course satisfaction

5. Conclusion

In the exploration and experiment of the multi-dimensional teaching of Chinese architectural history curriculum, this study draws a series of meaningful conclusions. First, the multi-dimensional model significantly improves students' learning efficiency, enabling them to absorb and understand the course content faster. Secondly, this teaching method is also excellent in improving learning outcomes, and students not only acquire the necessary knowledge, but also improve their critical thinking and innovation skills. In addition, students' satisfaction with multi-dimensional courses is generally high, which indicates that this interactive and participatory teaching method is well received by students.

Compared with traditional teaching methods, autonomous learning is still effective in some cases, but it is not as significant as multi-dimensional mode in improving learning efficiency, effectiveness and satisfaction. This suggests that educators should consider adopting more multi-dimensional teaching strategies when designing curricula, and provide appropriate support for self-directed learning, while adding interactive and participatory elements to traditional teaching.

Teaching practices should continue to explore the potential of multi-dimensional models of teaching, optimize their implementation strategies, and assess their impact on student learning experiences. The professional development of teachers should also include how to effectively apply multidimensional teaching methods and how to adjust to the different needs of students. Through these efforts, this study can look forward to achieving higher quality teaching outcomes in a wider range of educational fields.

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