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A Study on Incorporating Innovative English Grammar Teaching Spaces in Residential Buildings to Enhance Learning Effectiveness

Siqi Nong[1,*]
[1] Guangxi Police College, Nanning, Guangxi, 530022, China
Corresponding authors: (e-mail: suzzy77@126.com).

Abstract In order to enhance the motivation and learning effect of students' English grammar learning, this paper introduces the concept of residential architectural design into the construction of innovative English grammar teaching space, exploring the potential influence mechanism of educational space on language learning behavior. The study focuses on the systematic design of architectural elements such as site layout, color matching, light environment organization and spatial morphology composition of the teaching space, and builds an ontological model for the establishment of an intelligent space for grammar teaching that integrates emotional perception, so as to promote students' in-depth understanding of English grammar. The experimental results show that under this innovative educational space environment, the average score of the grammar test of the students in the experimental class is as high as 96.2, the standard deviation of the score is 3.4, the indicators of teaching satisfaction are higher than 90%, and the average number of times the students speak in each class is more than 5 times. The results of the study show that the innovative English grammar teaching space integrating architectural space optimization and intelligent teaching system can significantly improve the effectiveness of teaching and provide new ideas and paths for the integrated development of architecture and education.

Index Terms English grammar learning, architectural design, educational space, language learning, emotional perception

I. Introduction

With the development of the global economy and the increasingly close relationship between countries around the world, English is no longer an international common language in the traditional sense, but a basic language that is also used in daily life. Therefore, the importance of English in the education system has become more and more prominent in recent years [1]. Grammar is the core foundation of the English language, and the quality of its teaching largely determines the overall English proficiency of students. In the current English teaching system, grammar teaching is still dominated by the traditional classroom. The main body of teaching is mostly a one-way interaction between teachers and students, the teaching method is relatively single, the lack of technological support, it is difficult to mobilize students' learning enthusiasm, and the teaching effect is unsatisfactory [2].

The new English grammar teaching process is inseparable from multimedia technology, through the integration of multimedia images, text, sound and video, to improve the interactivity of the classroom, this paper, in order to improve the effect of English grammar teaching, puts forward the concept of residential architecture design into the innovative English grammar teaching space. Applying a series of design methods from residential architecture to innovative English grammar teaching space has obvious effects on the expansion of teaching space and the innovation of English grammar teaching mode. The research content of this paper provides a new practice place and mode for English grammar teaching, which can improve the learning effect of students. At the same time, it provides reference for the functional expansion of residential buildings and the optimal allocation of educational resources.

II. Design Strategies for Innovative English Grammar Teaching Spaces

II. A. Spatial siting and layout

Given that the residential building selected for this paper serves the teaching of English, the spatial address should be farther away from the kitchen or living room in order to avoid noise from affecting the learning of English grammar. For example, placing the English teaching space on the bottom edge of the building or on the top floor near the east or north side of the building, which is not only relatively quiet, but also has a gentle light that does not

shine directly on the blackboard and the students, so as to create an independent, quiet, comfortable and soft teaching space [3]. However, if the chosen location is facing north, artificial lighting should be added to make up for the lack of natural light.

In order to strengthen the effect of English grammar learning, blackboards or post-it walls can be added in the cafeteria, library and other areas to record key English grammar, so that grammar learning can be strengthened in the process of reading or eating, and the linkage between life and learning can be strengthened.

In terms of space design, the size of the teaching area should be flexibly adjusted according to the number of learners. The most suitable space for a single person is between 2.5-4.5m². However, if 4-6 people study, the study space area between 7.5-9.5m² is the most appropriate, and the lighting coefficient needs to be higher than 5% of the space to ensure that the students in the back row can clearly see the handwriting on the blackboard.

According to the needs of English teaching, the teaching space can be set up in the teaching area, interactive area and display area. Multimedia equipment is set up in the English grammar learning space to enhance the flexibility and interactivity of English grammar teaching and space, and to improve students' interest in learning as well as their comprehension of single times and grammar [4].

II. B.Environmental design

In the design of the English grammar teaching space, the walls of the teaching space need to use light blue, light green and light yellow and other bright and dynamic colors, so as to reduce the sense of pressure in the space and create a relaxed and lively atmosphere [5]. The color combination should be decided according to the teacher's usual classroom atmosphere, if the teacher is more serious, light blue can be used, but if the teacher's classroom is lively and vivid, light green can be used. The lighting of the teaching space can be a combination of natural light and lighting, in the daytime under the irradiation of natural light can help to improve students' attention, but if it is cloudy and rainy weather or in the evening, it is necessary to supplement the natural light through the lighting to improve the brightness of the entire teaching space. Blinds or opaque curtains are installed at the windows, and the brightness of the teaching space needs to be reduced to improve the clarity of multimedia when teaching multimedia grammar [6].

In order to optimize the acoustic environment, the walls of the teaching space need to increase the sound insulation boards, and the floor needs to be laid with a carpet in order to reduce the sound of the outdoor sound and the sound of the indoor walking. The interior of the teaching space also needs to be decorated with artistic and interesting decorations related to grammar learning content, such as Q-cartoon grammar puzzle stickers, regular grammar posters and special grammar pictures with famous landscapes in the background, an English version of the world map with pictures of different landmarks, and famous quotes with Q-cartoons of celebrities, etc. These designs not only enhance the learning fun, but also help to improve the learning environment. This kind of design not only enhances the fun of learning, but also stimulates students' motivation and continuity in learning English grammar through depressive culture, and enhances the sense of immersion and inspiration in the teaching space [7].

III. Intelligent model construction and application of teaching space

In order to strengthen the innovation of English grammar teaching space, an intelligent model is constructed, through which the situational awareness of classroom grammar knowledge points, random search, communication and interaction, knowledge quiz and accurate question-answering are realized, and the structure of the model is shown in Figure 1. The model takes the innovative teaching space, English grammar teaching, lecturers and student groups as the core elements to construct an intelligent teaching environment [8]. Among them, the ontology model is constructed based on emotional perception to realize in-depth understanding of English grammar. Fuzzy boundaries + keywords based on instant interconnection to realize on-the-fly search. Role switching + teacher guidance based on split-screen interaction to improve the classroom atmosphere. Blind spot identification based on feedback monitoring to discover students' knowledge mastery. Accurate Q&A through targeted correction to strengthen students' knowledge mastery and improve learning effect. In conclusion, the intelligent model effectively connects the physical layout of the teaching space and the digital interactive design, deeply integrates the architectural functions and educational objectives, and takes the establishment of an efficient, flexible and interactive English grammar teaching environment as the core of the design.

III. A. Intelligent-based situational awareness

Twinning technology, as a professional virtual technology, can virtualize the English language environment, and students can intuitively feel the grammar usage scenario in the virtual environment, which helps students better understand the English grammar usage warning. In the simulation process of twinning technology, it is necessary

to simulate with high fidelity the information such as the use environment of quotation, the time of use, the communication of characters and the social background [9].

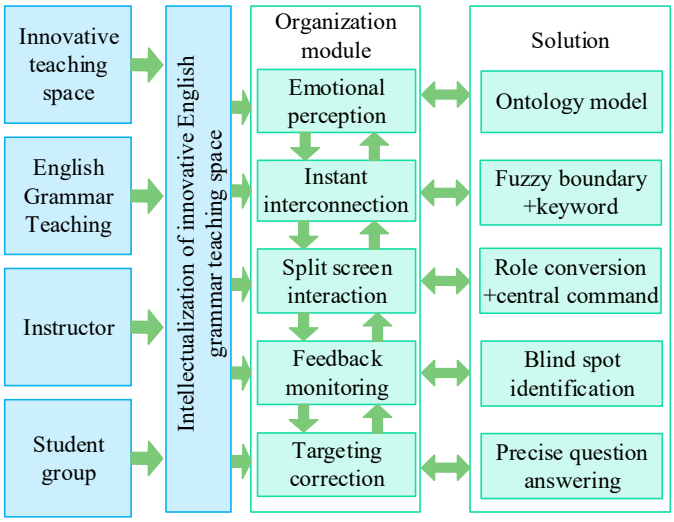

Figure 1: Model structure

Classroom situational awareness requires the construction of an ontological model that integrates concepts, constraints, and reality based on the goals of English grammar teaching. The ontology model is shown in Figure 2, which demonstrates the grammatical differences in verb selection in different usage scenarios. When the main goal is to complete a task and does not involve an entertaining or competitive task, the verb "do" is used as "do". However, when it comes to entertainment or competition, the verb of "do" is used as "play", and the use of "do" and "play" is explained through the auxiliary grammar of pictures, which helps students understand the grammar rules more intuitively, strengthens the memory and application of key points of grammar, further enhances the enthusiasm of learning, and broadens the realization path of educational functions in the architectural space.

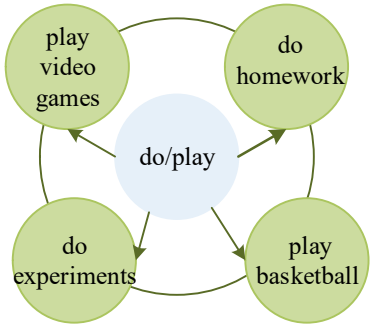

Figure 2: Ontology model

III. B. Intelligent-based instant interconnection

In the process of teaching English grammar, teachers often conduct random search for information with the help of multiple technological resources to reach the teaching goal due to the need of a certain knowledge point. When an on-the-fly search for a case is needed, keywords need to be entered into the search bar, and the network will extract the keywords and provide pictures and data that meet the requirements after searching through a huge number of pictures or databases, so Instant Interconnect can effectively remove random blind spots. After asking a question, students can get the answer through instant connectivity.

For example, the available words for “deformation”, “deflection”, “displacement” are deformation, deflection, displacement, etc. However, it is necessary to distinguish the actual words of each word. However, in order to distinguish the actual usage of each word, it is necessary to control the meaning and difference of different words through the combination of instant interconnection and situational awareness. For example, deflection is usually

the longitudinal deformation of a building beam, displacement usually refers to the positional change of a cross-section, and deformation indicates the change of the whole structure. Based on the intelligent and instant interconnection, students can master the application of specialized vocabulary as a whole and also improve the effectiveness of grammar teaching [10].

III. C. Intelligent-based split-screen interaction

Traditional English grammar teaching only through the blackboard writing for specific lessons, but with the development of multimedia technology, the current English grammar teaching can not only use the projection screen, but also the use of monitors, whiteboards, and other intelligent terminal equipment, the use of multimedia technology can help the teaching content of the rapid transmission to the rest of the monitor, and in the process of multimedia teaching can be the focus of the grammatical explanation, and ultimately will be the The entire teaching content is presented to the students through multimedia. Students are guided to change the classroom goal of "learning" to "learning + using", which reinforces the practical application of knowledge [11]. In the classroom, 4-5 students as a group, the split-screen interaction can not only improve the enthusiasm of students' learning, but also strengthen the communication and interaction between students, drive the classroom atmosphere, and enhance the learning effect of English grammar. In the teaching process of split-screen interaction, the dominant position of the teacher remains unchanged, but the students are transformed by the dominant into the dominant in the classroom, forming the classroom double subject mode.

III. D. Intelligent-based feedback monitoring

Intelligent feedback monitoring in the space of teaching English grammar refers not only to the mastery of students' learning, but also to the elimination of students' unsatisfactory grasp of grammatical knowledge, in which the teacher is the main body of the intervention behavior. Therefore, intelligent feedback monitoring of teaching is the design of a series of tests to identify the number of students who do not have a good understanding of grammatical knowledge and the areas of knowledge in which the understanding deviates [12]. In other words, it is a test to understand the knowledge areas that students have mastered well and the knowledge areas that they have mastered poorly, and this paper gives a real-time statistical method to facilitate the precise identification of classroom effects, so that the "fuzzy synthesis + single indicator" evaluation method can be utilized to quickly provide teachers with a basis for decision-making, and to select the specific content to be added to the explanation.

III. E. Intelligent-based targeting correction

The traditional targeting correction is that the teacher explains the poorly mastered knowledge points over and over again, while the intelligent targeting correction is to shift the focus from lectures to the students themselves, discover the students' character traits, interests and their own strengths, do not judge the good and the bad on the basis of their grades, and respect the students' differences in IQ, personality, etc., and focus on the needs of the students, and complete the targeting correction to improve the learning effect of the students by outputting the poorly understood knowledge points to the students individually based on the feedback and monitoring. On the basis of "Feedback Monitoring", we will output the knowledge points that are not well understood to the students individually, and complete the targeted correction to improve the learning effect of the students.

IV. Experimental analysis of learning effects

IV. A. Experimental design

This paper studies the English grammar teaching spaces in an educational institution located on the 12th floor of an office building in the center of the city, and the English grammar teaching spaces are all located near the east side or facing north. The spaces are illuminated with multiple lights to compensate for the gray light in rainy weather or in the evening and to ensure the visual comfort of the students, and each space has an area of 10 m^2 and 6 students. The institution has installed computers, projection screens, monitors, whiteboards, smart terminals and speakers in each English class to facilitate the use of multimedia equipment in the program. Teachers' walls are decorated with a variety of posters, sticky notes and famous quotes related to English grammar, creating a favorable environment for English learning and a good balance between functionality and education in the teaching environment.

IV. B. Analysis of learning outcomes

In this paper, the English grammar teaching space offered by educational institutions was used as the object of study, and seven of the classes were selected as the experimental group, and the innovative English grammar teaching space proposed in this paper was used for teaching during a three-month teaching cycle. After the teaching was accepted, the students' test scores and standard deviations were statistically analyzed. At the same

time, another educational institution using the traditional English grammar teaching space with the same setup conditions was selected as the control group. Before conducting the teaching experiment, the English grammar scores of the students in the two groups were tested and found to be not significantly different.

Figure 3 shows the results of the comparison of learning achievements. The mean of the class achievement of the control group is 72.7 points, while the mean of the class achievement of the experimental group is 96.2 points, which indicates that the innovative English grammar teaching space in this paper helps to deepen the students' understanding of grammatical knowledge, and improves the students' motivation to learn while improving their learning outcomes. The highest standard deviation of the class scores in the control group is 9.5 points, while the highest standard deviation of the class scores in the innovative English grammar teaching space is 3.4 points, which indicates that the learning differences between students and pupils within the experimental group have been significantly reduced, and that the overall mastery of grammar has become more balanced. It can be seen that the innovative English grammar teaching space effectively supports the process of grammar teaching and enhances students' comprehension and application of complex linguistic structures through reasonable spatial layout, light and multimedia equipment integration and other architectural means.

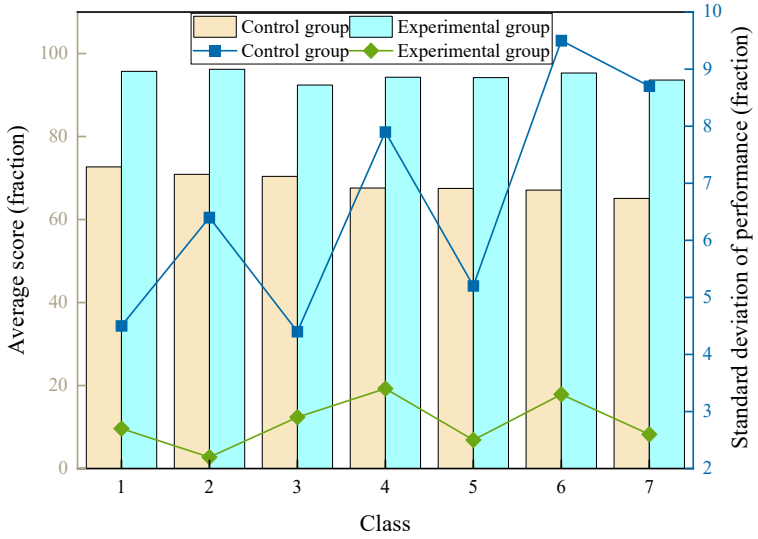

Figure 3: Comparison results of academic achievements

IV. C. Satisfaction analysis

In order to improve the quality of teaching and space optimization effect, two educational institutions respectively issued satisfaction questionnaires to the students of seven classes in their institutions, and summarized the satisfaction ratings of each topic in the questionnaires, analyzed the students for the classroom location, classroom acoustic effects, classroom space, classroom light, classroom learning atmosphere, teachers' teaching modes, and the average number of times of speeches in a class to summarize the investigation of the students on the English grammar teaching environment satisfaction is shown in Table 1. The students in the experimental group all rated the teaching space higher than 90 points, of which the highest rating was given to the teaching mode because intelligent multimedia technology was used to assist the teaching process in the grammar teaching process, so that the students could learn grammar knowledge in a high fidelity situation, increase the firmness of knowledge mastery and improve the classroom learning effect. At the same time, the average number of speeches made by students in each class is more than 5 times, which is much higher than that of the control group. It shows that through the reasonable design of the teaching environment, flexible spatial layout and the embedding of technological equipment, not only creates a positive and interactive learning atmosphere, but also stimulates the students' enthusiasm for participation and desire for expression, and further enhances the activity of English grammar teaching.

Table 1: students' satisfaction with English grammar teaching environment

Evaluation items	Educational institutions	
	Control group	Experimental group
Classroom location/%	81.27	90.46
Classroom sound insulation effect/%	77.46	91.51
Classroom space/%	75.21	91.47
Classroom light/%	75.89	91.25
Classroom learning atmosphere/%	79.44	92.32
Classroom teaching mode/%	70.37	94.38
Students' average number of speeches per class/time	1.37	5.31

V. Conclusion

This paper integrates the residential architecture concept into the design of innovative English grammar teaching space, considers the spatial location, layout, color, and light, and constructs an innovative English grammar teaching space model that combines multimedia technology. Through this intelligent model, students' English grammar learning effect is improved. In this paper, the teaching institution using innovative English grammar teaching space is set as the experimental group, and the institution under the traditional teaching method is the control group, and the average scores and standard deviations as well as satisfaction of the two institutions are statistically analyzed. The results show that the average class score of the experimental group is 23-28 points higher than that of the control group, and the standard deviation is 2-6 points lower than that of the control group, and the use of innovative English grammar teaching space can significantly improve students' English grammar learning effect. Meanwhile, the satisfaction of students in the experimental group were all above 90%, and the number of classroom answers to questions was higher than 5, which strengthened the interaction between teachers and students. Therefore, it is feasible to integrate the concept of residential architecture into the innovative English grammar teaching space. Through reasonable space design, environment creation, configuration of teaching facilities and selection of teaching methods, we can create an innovative, interactive, situational and personalized teaching environment that meets the learning needs of students and stimulates their interest and motivation in learning.

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