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Optimization Path of English Smart Education Ecological Development Based on Artificial Intelligence and Sustainable Concept

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Abstract: Educational ecology is a science that explores the inherent laws of the educational system from an ecological perspective. Its goal is to explore the ecological laws of the education system in a specific social context. It explores how to construct a scientific, coordinated, and sustainable development of education ecology from the perspective of ecology, so as to exert the effectiveness and maximum effect of education. However, in today's society, especially in English education, traditional English teaching can no longer meet the needs of modern society for talent training. Therefore, vigorously developing the intelligent education platform can not only better adapt to the life and learning of today's society, but also is of great significance. This paper built an English smart education platform based on artificial intelligence (AI) under the concept of sustainable education ecology, which can improve the efficiency of English teaching and students' interest in learning. The experimental results showed that after the students have been trained by the AI smart education system constructed in this paper, their English scores have been significantly improved. Among them, the average scores of English listening and writing questions both increased by 3.1 points; the average score of speaking questions increased by 1.3 points, and the average scores of reading comprehension and translation questions both increased by 2.5 points. It can be seen that the system has certain effectiveness in helping students improve their English performance.

1. Introduction

Ecology is a systematic science involving the relationship between man and the environment. An important concept of ecosystems is sustainable development. Educational ecology takes multi-dimensional interaction as the main content to explore its role in the educational ecological environment. Ecological factors are diverse in various fields of education, and they play different roles in nature. The educational ecological environment is composed of natural, social, material, spiritual and other factors. They penetrate and interweave, forming a multi-dimensional and intricate network. Each ecological element has the greatest impact on educational activities through optimal interaction. The ecological teacher development model emphasizes the integration of

various resources for teacher's own development. Through the effective integration of various resources, the rational allocation and use of resources can be realized, and the effective supply of various resources required by teachers' own development can be ensured, thereby realizing the sustainable development of teachers themselves. The ecological teacher's development view is to regard the teacher and the surrounding environment as an interactive network, which exchanges and interacts with the surrounding environment in terms of material, energy and information. The new requirements of the new curriculum standard for English teaching require that the teaching mode should adapt to the environment, and should develop and innovate continuously according to the environment. Therefore, the choice of teaching mode should also be the same, and it is necessary to highlight the dominant position of students and simulate the learning environment inside and outside the classroom. In English smart teaching, the system can be used as a teaching manager, teaching assistant, or even a teaching goal. In the process of students' learning, the computer system can assist the teaching of teachers and students, and gradually form a hybrid teaching mode of traditional classroom, online classroom, and human-computer integration. In this hybrid teaching mode, the relationship between machines and teachers, and between machines and students undergoes subtle changes, that is, intelligent systems should assist teachers and students in teaching activities. Schools should expand information acquisition channels for teachers, and establish teacher-student mutual visits and teacher exchange platforms. At the same time, schools should also give teachers more opportunities to participate in training and communicate with their professionals. At present, although there is a certain market prospect for the practical application of English education, it is still a blank. A large number of teaching practices have proved that English teaching is also in urgent need of technical support to optimize English teaching. The nature of technology can just make up for this shortcoming, especially to create an English learning environment in a natural language environment. Therefore, this paper conducted an in-depth discussion on the development of AI English technology from the perspective of environmental engineering. From the perspective of ecology, the development path of English was optimized, and the professional development ecology of English teachers was analyzed. Based on the basic idea of environmental engineering, a new mode of teaching technology development was established, and how to achieve sustainable, rapid and healthy development in teaching technology development were discussed.

The innovation of this paper is that it is started from the perspective of sustainable education and took English smart teaching as the starting point, the AI English teaching module was designed, which was expected to provide some reference for the practical application of English teaching. Moreover, this paper took this as a starting point to discuss the specific application scenarios and implementation methods of AI in English teaching, so as to achieve the purpose of optimizing the ecological development path of English teaching.

2. Related Work

Wisdom education is an important branch of education, which is gradually being recognized and recognized by people, and many scholars are discussing and studying it. Saputri S W conducted an analysis of students' developmental achievements by using local wisdom modules. He believed that when using the local intelligence model, student performance would be significantly improved [1]. Huang Y conducted a preliminary discussion on the construction of English smarter classrooms in colleges and universities under the network environment through the research on English classroom teaching practice [2]. Sari I believed that integrating local wisdom education into the background of English teaching is the key to maintaining cultural heritage. There are two motivations for learning English as a foreign language: one is instrumental motivation, and the other is comprehensive

motivation [3]. The above scholars' research on wisdom education is relatively complete, but most of them only stay in theoretical research and lack practical basis.

Scholars in the educational technology field attach great importance to the application of AI, and have gradually turned to technology research and development in theory, so they have made great achievements in recent years. Liu S established a visualization-based AI teaching data analysis framework, and studied the process and mechanism of talent education training data visualization from the aspects of time and media form [4]. Faisal R believed that AI in education can play a huge role in maximizing students' academic performance, and can contribute to an increasingly knowledge-based, automated society [5]. Martiniello N believed that AI-based applications can promote the learning of all tertiary students, and can also help the education of students with disabilities [6]. Barrett believed that AI technology can be applied to applications for admission, course scheduling and campus visits. The application of AI technology to higher education would improve the communication ability of teachers [7]. Through a case study of economic education and learning, Lin P H discussed how AI robots can be used in students' online asynchronous learning to improve students' learning efficiency [8]. However, the current research on the construction of AI teaching environment and the adaptive learning support of intelligent teaching system by scholars from various countries is still very weak, and further research is needed.

3. Design of English Smart Education Service Platform

3.1 System Concept and Functionality

The English intelligent education platform is a commercialized platform, which is committed to providing a commercial cloud computing platform for education and teaching [9]. Based on the investigation of the school's work, study, and scientific research activities, it conducts service identification, service classification, service boundary definition, service definition, service development and release from the aspects of teaching field analysis, business process analysis, and data analysis, rather than the system integration and system resource integration platform based on each school [10-11]. On the English smart education platform, different schools can provide personalized services on this platform according to their own English needs. This not only expands the types of education and teaching, but also meets the needs of users at different levels. Although the smart education platform is a commercialized education platform, it can meet the needs of users in different cities, towns and regions.

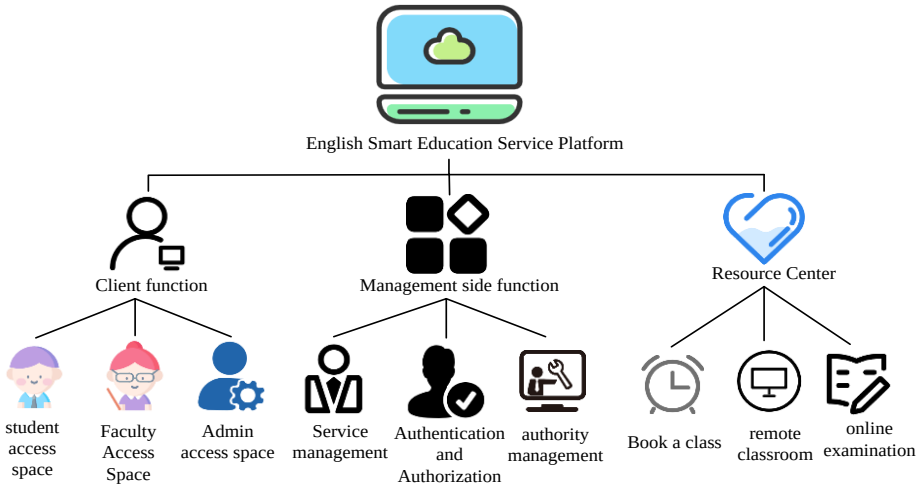


Figure 1. Structure diagram of smart education service platform

From Figure 1, it can be seen that the entire smart teaching platform can be divided into two categories: one is user access, and the other is service provider [12]. The user's access is the entrance to the service entity, and also the starting point for accessing the data. The users of each platform have different requirements and service differences. Therefore, on the user's access side, different access spaces can be configured and accessed according to the user's needs. The web service space allows users to freely configure some public services in the web page, so as to achieve the configurability of services. Cloud computing service providers include two main systems: platform service management center and platform service resources [13-14]. The service management center is to manage all the business of the platform comprehensively. Platform service resources are the concentrated expression of education and teaching services, business-level services, supervision services and other services. English teachers can use the system interface to design teaching courseware in the resource service center, and upload the teaching video to the Internet; teachers can use data mining technology to evaluate the overall situation of the English test, including English test scores, students' knowledge structure, comprehensive language application ability analysis, teaching reference, etc. Secondly, through the knowledge description module of the system, preview and review can be performed in the form of video or text, and the knowledge learned can be applied to teaching. Finally, through the practice of systematic exercises, students can understand their English knowledge and check their own knowledge, including English reading and listening. Teachers can also conduct paperless tests on students in this way to test students' practical knowledge [15]. Therefore, the platform can not only provide a certain reference for English teachers to teach students in accordance with their aptitude, but also help students' personalized training.

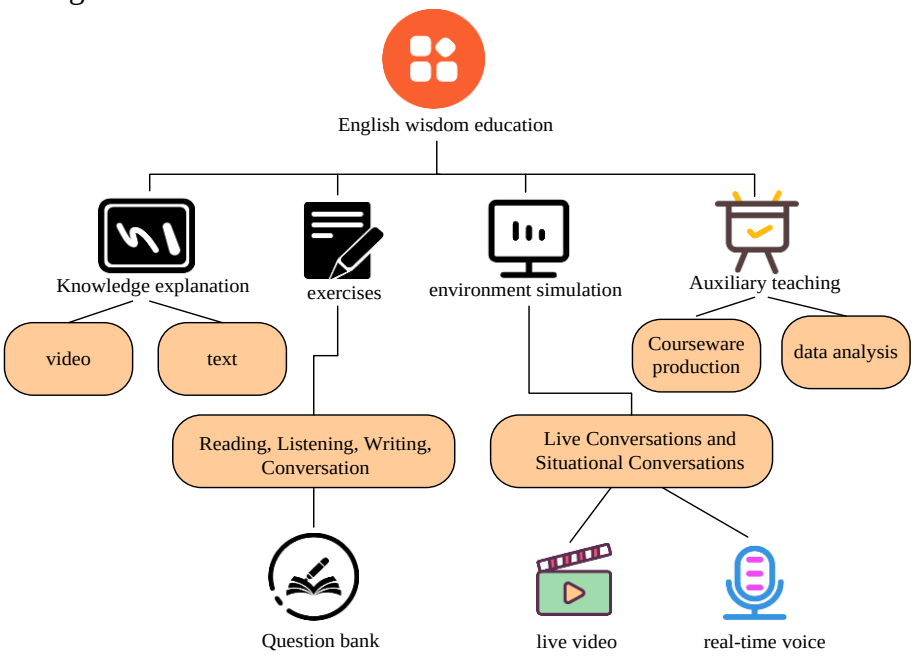


Figure 2. English smart education function module

It can be seen from Figure 2 that the functional modules of English intelligent education are mainly composed of English knowledge explanation, exercise test, environmental simulation and auxiliary teaching. The main function of this module is to conduct instant video chat and instant voice through the network. The main function of this module is to provide a teaching platform for teachers and to give them corresponding technical guidance. On this basis, a new method based on data mining technology is proposed. Teachers can use the "courseware" production function in the

auxiliary teaching module to upload the downloaded courseware to the "online". In this way, teachers can store their own courseware or online resources in the database. At the same time, teachers can also upload English question bank, test paper answers, etc. to form a complete knowledge base. Based on this knowledge base, the system makes correct or incorrect judgments according to the actual situation of the students, thereby continuously improving the system's judgment on problems. Finally, according to the test scores, the candidates are intelligently analyzed, and an analysis report is drawn, which makes some suggestions for teachers and students. These suggestions mainly include the composition of the scores, the results of each type of test, the mastery of the test content, and whether it is possible to continue to the next round of study. It can be seen that with the help of machine learning, students can better grasp their own learning situation, and can adjust teaching strategies in a timely and efficient manner, so as to maximize the quality of English teaching.

In the English teaching system, each article would be retrieved once. English learners can use the mouse to click, or touch the screen. It would extend relevant knowledge to English extracurricular knowledge according to the user's preferences, so that English learners can get the fastest and best experience. In this intelligent environment, English learners can have a richer English knowledge structure and a deeper understanding of English, so that they can better understand English.

The offline state refers to the state of not being connected to the Internet, that is, not being able to access the network, which is the so-called offline operation. In this case, the device used by the user plays both the role of the server and the client, so the software must be downloaded before installing the client, because all simulation and data access are done in this database. In the network state, either C/S mode (client/server architecture) or B/S mode (browser/server architecture) can be used. When installing the client, one can freely choose to download the library, or one can directly access the server through the browser without installing the client.

3.2 Ecological Environment of English Education

The development ecological environment of English education can start from the perspective of individual ecological development, and combine the internal ecological environment of teachers' personal growth with the external ecological environment. The internal ecological environment of English education is composed of English teachers' professional knowledge, public basic knowledge, professional skills, professional sentiments, professional ethics, and psychological factors. The external environment of the school can be divided into: macroscopic social culture, economy, politics, etc.

3.3 Performance and Causes of the Ecological Dilemma of English Education

Ideally, the educational ecology maintains a dynamic balance among the aforementioned internal and external environments. However, the actual English teaching ecosystem frequently faces structural imbalances and developmental bottlenecks. To systematically diagnose the specific manifestations of these ecological dilemmas, an empirical investigation is imperative.

This paper studied the current situation of English ecological teaching by means of a questionnaire survey. By adopting the ideas and methods of ecology, the current development of English education was studied. From the ecological point of view, the restrictive factors restricting the development of English teaching were found. This paper started with English teaching and environment, and creates a good ecological environment by overcoming the unfavorable factors in the development of English. Therefore, the ecological balance can be maintained and the sustainable development of English education can be promoted. In this survey, questionnaires were distributed to 140 English teachers in five schools in a city, and 130 valid questionnaires were

returned. Questionnaires were distributed to a total of 365 students in three grades in one of the schools, and 360 valid questionnaires were recovered.

(1) Basic information of teachers

Table 1. Questionnaire results

Category	Classification	Number of people	Proportion
Gender	Male	60	46.2%
	Female	70	53.8%
Age	20~30 years old	41	31.5%
	31~50 years old	61	46.9%
	Over 50 years old	28	21.6%
Teaching experience	1~5 years	20	15.4%
	6~15 years	84	64.6%
	15+ years	26	20%
Education	Undergraduate	85	65.4%
	Postgraduate	35	26.9%
	Master's and Ph.D.	10	7.7%

It can be seen from Table 1 that among these English teachers, the proportion of female teachers was greater than that of male teachers, and most of the teachers were between 31 and 50 years old, accounting for 46.9%. The teaching age of 6 to 15 years accounted for the largest proportion, which was 64.6%. Among these teachers, the proportion of master's and doctoral degree was the least, which only accounted for 7.7% of the total number. It can be seen from the survey results that there was an ecological imbalance in the process of teachers' professional development. Quantitative demand is no longer the main problem faced by the English teaching team, and the quality of the talents imported by the teaching team has become the main contradiction in the development of teachers. Therefore, it is necessary to vigorously improve the quality of the input talent flow of the teaching team, and improve the overall educational level of the existing teaching team.

(2) Teaching methods used in English teaching

Table 2. Teaching methods survey

Topic	Options					
What teaching method are you currently using?	Identity	Teaching method	Practice method	Demonstration	Practice law	Discussion method
	student	41.8%	23.6%	7.1%	12.4%	15.1%
	teacher	38.7%	5.3%	16.4%	13.3%	26.3%

It can be seen from Table 2 that most teachers usually use the teaching method in English teaching, which accounted for 41.8%, and only a small number of teachers used the demonstration method to teach English. The students thought that their teacher used the practice method at least 5.3%.

(3) Scientific research ability and knowledge system

Table 3. Research awareness survey

	Often	Occasionally	Rare	Never
Do you often pay attention to the latest developments in English teaching?	37%	46%	14%	3%
Whether you often pay attention to the latest research trends in educational science?	30%	17%	50%	3%
Number of papers published	0 articles	1-5 articles	6-10 articles	10 or more
	39.3%	57.3%	3.4%	0%

In the survey on whether English teachers often pay attention to the latest development of English teaching shown in Table 3, nearly half of the teachers only pay attention occasionally, and only about 40% pay attention often. When asked if they often pay attention to the latest research trends in pedagogy, half of the teachers said they rarely pay attention, and only 30% of the teachers often pay attention. In publishing English academic research, nearly 40% of the teachers said they had never published papers, and the number of teachers who published more than 10 papers was 0. It showed that most of the teachers' papers published less, and the English teachers' scientific research ability is generally low.

(4) Satisfaction of students and teachers with the status quo of English education ecology

To sum up, the main problems facing the development of English teachers are: educational qualifications are generally low; teaching methods are not novel enough; scientific research ability is insufficient, and effective on-the-job training is lacking; they are not satisfied with the status quo of English education ecology. Therefore, in order to make the English education ecology develop sustainably, it is necessary to improve academic qualifications and educational environment. To directly address these identified ecological dilemmas, the previously designed English smart education service platform acts as an environmental optimization intervention. By providing intelligent auxiliary teaching modules and rich simulated environments, the system compensates for the limitations of traditional teaching methods and the lack of teacher training resources. The subsequent sections evaluate the practical effectiveness of this AI-driven platform in restoring the ecological balance and enhancing learning outcomes.

4. Evaluation of AI Smart Education Teaching Methods

4.1 Teaching Method Test Results

In the research of student user usage, this paper used the method of comparative analysis to compare the teaching of AI intelligent system with the traditional English teaching method. The test selected 10 students and numbered them from 1 to 10, and then tested on five major questions including listening, reading comprehension, speaking, writing, and translation. Each type of question was worth 20 points for a total of 100 points. After each student used the system for a week, their academic performance was checked again.

Table 4. Scores of ten students

type	hearing		reading comprehension		spoken language		writing		translate	
	traditional education	AI teaching	traditional education	AI teaching	traditional education	AI teaching	traditional education	AI teaching	traditional education	AI teaching
1	10	14	12	13	13	16	8	13	14	16
2	12	14	9	13	10	13	10	16	12	17
3	8	12	13	15	11	12	11	15	14	15
4	17	20	10	14	15	16	12	14	8	10
5	14	15	13	13	9	10	14	16	6	9
6	11	15	12	13	18	20	9	15	11	13
7	12	15	15	18	14	15	11	12	11	15
8	15	20	13	17	9	10	11	13	14	17
9	9	12	8	10	11	10	12	12	11	12
10	13	15	5	9	7	8	13	16	12	14

It can be seen from Table 4 that the scores of these ten students have been significantly improved

after being trained by the AI smart education system, and only a small percentage of students' grades remained unchanged. Among them, students No. 4 and No. 8 got full marks for listening questions after training, and student No. 6 also got full marks for speaking questions after training.

The average score of the ten students was calculated by comparing the average scores of the traditional teaching method and the AI smart education system, so as to test the effect of the system in practical teaching. The results are shown in Figure 3.

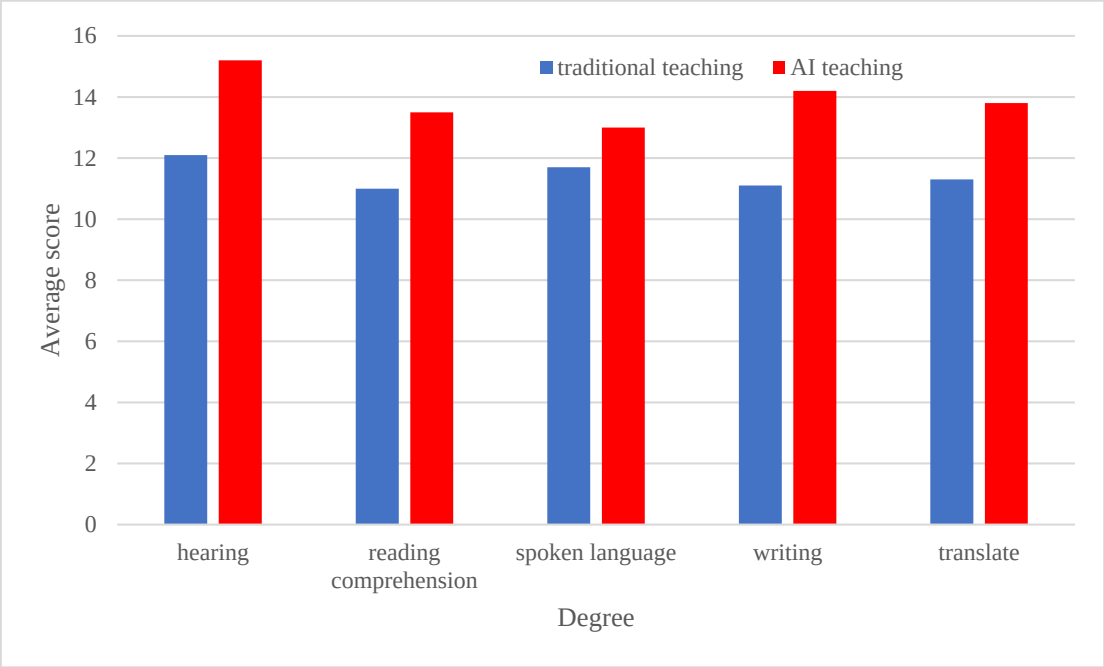


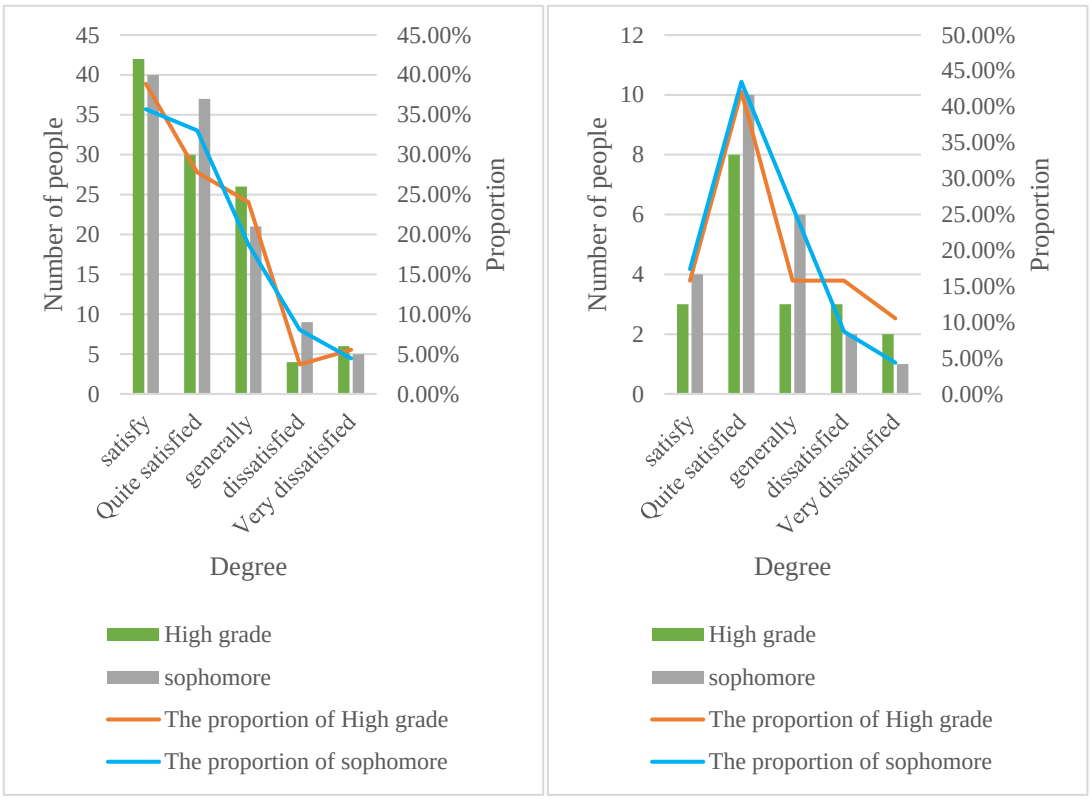
Figure 3. Comparison between traditional teaching and AI smart teaching

From Figure 3, it can be seen that after the training of the AI smart education system, each type of English topic had improved by 1 to 4 points. Among them, the average scores of the English listening and writing questions both increased by 3.1 points; the speaking scores were lower, but also increased by 1.3 points on average; the remaining reading comprehension and translation questions both increased by 2.5 points.

4.2 Evaluation of Smart Education System

Finally, the survey of students' and teachers' attitudes towards the application of this system in teaching was analyzed. The subjects of the survey were 220 students and 42 teachers in the two grades after using the AI smart education system. The data shown in Figure 4 was obtained by sorting and analysis.

In the data results shown in Figure 4(a), the High grade and sophomore students had the most “satisfied” attitudes towards the AI smart education system, which were 38.89% and 35.71% respectively. Only about 1 in 10 students expressed dissatisfaction with the system. In the data shown in Figure 4(b), most of the English teachers in the High grade and sophomore were satisfied with the system, while only a few English teachers were dissatisfied with the system. To sum up, the AI smart English teaching system is helpful to the improvement of students' English learning test scores. It can help to improve students' English achievement and interest, and can optimize the effect of English teaching, which also provided practical significance and guidance for the exploration of this paper.



(a) Students' attitude towards AI smart education system (b) Teachers' attitude towards AI smart education system

Figure 4. Satisfaction of students and teachers in two grades with the AI smart education system

5. Conclusions

The application of artificial intelligence in English teaching not only has an important impact on the development of AI in modern education, but also has an important impact on the balanced development of education in society. School factor is an important factor affecting the development of English. As long as it is adjusted to an ecosystem suitable for the development of English education, then these factors would become a favorable factor to promote the development of English teaching, and thus have a positive impact on the development of teaching. This paper organically integrated AI technology and smart English teaching, and analyzed the characteristics of the smart education platform. In addition, the relationship between AI and English teaching and the importance of AI in English teaching were also discussed. Under the guidance of the sustainable educational ecology concept, this paper built an AI-based English intelligent teaching platform, and optimized the development path of the English teaching ecology. Finally, the experimental verification of the system was carried out. However, smart education starts from the basic idea of environmental engineering. The discussion of smart English teaching in this paper is in the initial stage, and the operability of the established system needs to be continuously improved.

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