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Teaching Mode of Intelligent Service Assisted Design Course Based on Human-Computer Interaction in the Intelligent Era

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ABSTRACT
As AI technology matures, computational intelligence has also been more widely used. Computational intelligence is an important branch of AI. Because of its global search, efficient parallel and other characteristics, it has become a new method to solve complex optimization problems and has received more and more attention. In the meantime, driven by other technologies such as big data, education has gradually broken away from the traditional teaching methods, broken the traditional time and space constraints, and opened a new chapter. With the reform of the national curriculum instructional patterns, the exploration and practice of educational informatization in the educational circle is rising, and the instructional patterns of intelligent service aided design curriculum is also coming. In this paper, a teaching mode of intelligent service aided design with human-computer interaction (HCI) as the core was proposed. Based on the available results, it is an important reference value for its application and promotion in practice. Through the empirical analysis of the course instructional patterns of intelligent service aided design of HCI under computational intelligence, the classroom instructional patterns method of intelligent service aided design of HCI in the intelligent era proposed in this paper has improved 12.7% in promoting students' understanding of teaching content compared with traditional methods and has increased by 19.7% in improving students' full satisfaction with course teaching. Besides, in terms of overall teaching effectiveness, it has improved 22.9% compared to the traditional. It illustrates that the teaching methods presented in this paper can better serve students' development and improve their overall quality, and also meet the teaching needs of teachers, so that teachers can better carry out teaching activities. At the same time, the curriculum teaching mode of human-computer interaction intelligent service aided design in the intelligent era was discussed, which was conducive to promoting the gradual maturity of the development of computational intelligence and making its application in teaching more complete.

Keywords: Course Teaching Mode, Intelligent Service, Human computer Interaction, Intelligent Era

1. Introduction

Schools, as educational bases for cultivating national talents, also follow the intelligent era and use various intelligent technologies applied to teaching aids and student learning aids.

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For learning assistance, intelligent technology can help students better master knowledge, improve learning ability, and personality development through data analysis, natural language processing, and other technologies [1-3]. For example, the online learning platform based on artificial intelligence can recommend learning resources suitable for students according to their learning situation. At the same time, the data in the learning process can also help teachers better understand the learning situation of students in order to target teaching [4-5]. In terms of teaching assistance, intelligent technology can help teachers to better conduct classroom teaching through natural language processing, speech recognition, computer vision and other technologies [6-7]. For example, classroom Q&A system based on artificial intelligence can help teachers automatically analyze students' answers and give corresponding evaluation and feedback so as to better improve the learning effect. At the same time, the intelligent teaching video analysis system can automatically identify the key information in the teaching video and automatically generate corresponding notes and diagrams, so that students can better master the course content, and also provide better teaching aids for the partially sighted and visually impaired students [8-9]. The design of intelligent service-assisted curriculum is a complex and meaningful task, which needs to be oriented to the students' needs, according to the students' learning needs, and select the appropriate data processing and algorithmic solutions in order to provide more personalized educational services and performance assessment [10-13]. For example, different teaching modes can be customized for different students, and appropriate learning resources and feedback can be provided. In addition, there is a need to consider teaching and learning scenarios such as classroom teaching, online courses, independent learning, etc. For different scenarios, different technical support and teaching methods need to be provided to meet the needs of teachers and students [14-15]. There is also a need to ensure that data and privacy are not compromised or violated. The use of intelligent service assistance in the field of education needs to fully consider the issue of data security and privacy protection, comply with the laws and regulations, and develop appropriate data security and privacy protection policies [16-18].

In the future, with the continuous development and innovation of intelligent technology, intelligent service assistance will play an increasingly important role in the field of education and promote the continuous innovation and improvement of education methods.

This paper explored the instructional patterns of intelligent service aided design course of HCI in the intelligent era under computational intelligence. Through research, it was found that the intelligent service aided design of curriculum instructional patterns could better discover the teaching and students' needs, so as to design targeted curriculum instructional patterns for teachers to better promote the reform and innovation of instructional patterns.

2. Theory of Human-computer Interaction and Intelligent Service Assisted Curriculum Teaching Mode in the Intelligent Era

2.1. Overview of Course Teaching Mode

2.1.1. Concept of Course Teaching Mode. At present, there are different opinions on the research of curriculum instructional patterns. Some scholars believe that the concepts of "curriculum" and "teaching process" are basically the same. They all pay attention to the structure, stage, procedure and strategy of the teaching process, and pay attention to the dynamic description of the effective operation of each link. This kind of concept focuses on a single teaching sequence and steps. Curriculum instructional patterns is a kind of teaching process, or a kind of teaching structure. However, it emphasizes a kind of process and pays attention to the perfection of the process, which neglects the exploration of the objective laws of teaching. Others believe that the combination of "curriculum teaching" and "teaching methods" is very similar. For example, curriculum teaching is a system of organizing, designing and regulating teaching activities based on teaching practice. Such

ideas are mostly used in specific methods, but this is only a form of curriculum. Some scholars believe that what is similar to teaching design is the instructional patterns of curriculum. The curriculum instructional patterns is a relatively fixed strategic system of teaching processes and teaching methods based on teaching concepts and laws, including the combination of various links, teaching steps and teaching strategies. In this paper, "Curriculum teaching" means that under the direction of specific teaching concepts and theories, teachers and students achieve specific teaching objectives and contents under specific teaching situations and resources, as shown in Figure 1.

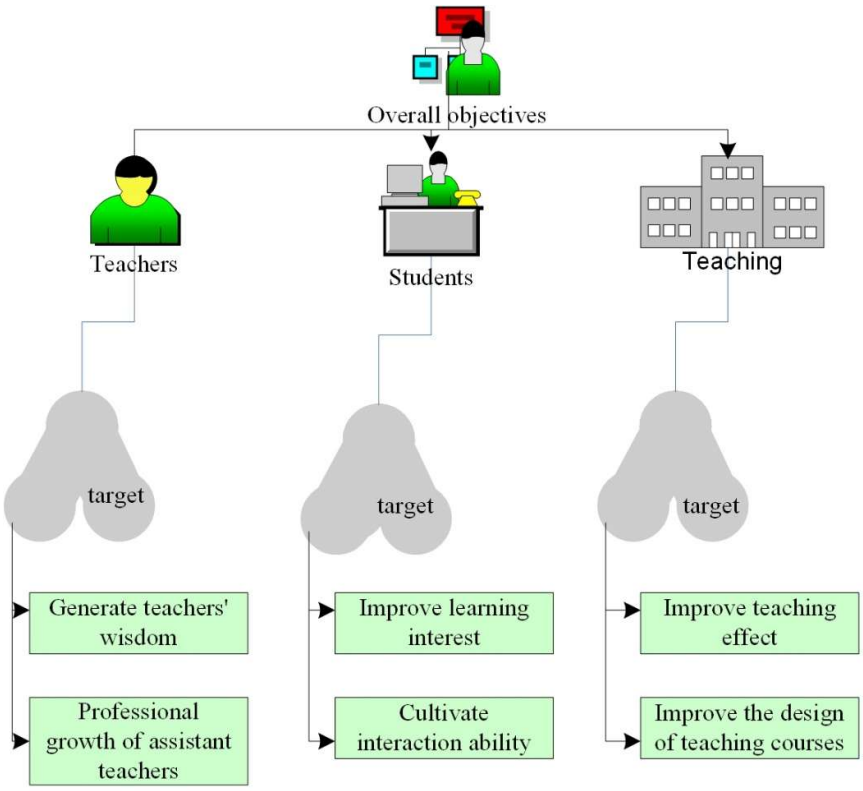

Fig. 1. Overall structure of teaching mode

2.1.2. Current Situation of Curriculum Teaching Mode. Under the traditional curriculum instructional patterns, teachers are the communicators of knowledge, with teaching as the core and subject. The students are the receivers of knowledge. The media are the tools of teaching, and the textbooks are the contents of teaching. Student achievement is the witness of teachers' overall teaching level. The classroom is the main teaching environment and an important place for teachers to teach. In general, the whole educational activities and teaching organizations are teacher centered. Teaching level, teaching skills and teaching art are all important factors that affect students' learning effectiveness. In the context of exam oriented education, academic performance is the most intuitive embodiment. Currently, there are still many problems with the traditional curriculum instructional patterns. First, the vast majority of teachers rely on traditional courses or are influenced by traditional methods of teaching courses when acquiring knowledge. Secondly, the subjectivity of teachers shows personal differences due to different regions, schools and teachers, which leads to differences in professionalism, responsibility and teaching effectiveness. Third, teachers deal with textbooks in a systematic way. Fourth, under the traditional teaching methods, most teachers' teaching methods are on the rigid side and their approaches are single. Under the traditional classroom teaching mode, students only passively accept the knowledge imparted by teachers. With the rapid development of science and technology, people's education level is constantly improving

and knowledge is constantly updated, the traditional way of teaching curriculum is facing a severe test.

2.2. Overview of Intelligent Service Aided Design

2.2.1. Intelligent Service Concept. Intelligent service is a service that can automatically identify the light and dark needs of users and actively, efficiently, safely and green meet their needs. Intelligent service is an active service intelligent system based on the actual needs of customers. It can form a demand pattern according to the basic data of customers and the data of the system, thus realizing data mining and service intelligence. While studying the explicit needs such as customers' needs and preferences, potential needs related to time, identity, work and living environment can also be found, so as to actively provide accurate and fast services for customers. Intelligent service is divided into three layers: intelligent layer, transport layer and interaction layer. The specific hierarchical structure is shown in Figure 2.

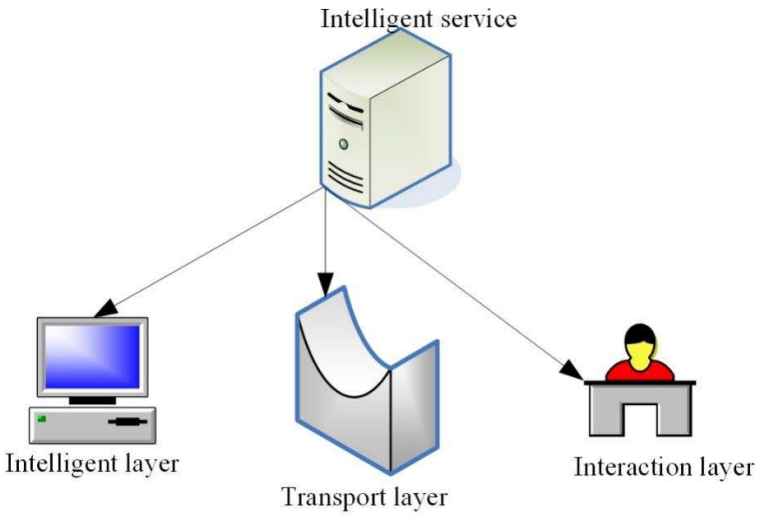

Fig. 2. Hierarchical structure of intelligent services

2.2.2. Teaching Mode of Intelligent Service Aided Design Course. Intelligent service aided design is to use intelligent devices to discover the explicit and implicit requirements of the required design goals and carry out targeted and creative design. Therefore, the instructional patterns of the intelligent service aided design course is to use intelligent instruments to discover the needs of different teaching processes, which can design targeted and creative courses for teachers. Finally, the goal of attracting students' interest, improving teaching effect and promoting students' all-round development is achieved.

2.2.3. Problems in Teaching Mode of Intelligent Service Aided Design Course. Intelligent service aided design has a great application prospect, but it has many shortcomings in the application of teaching. The fundamental reason lies in the lack of effective HCI between teachers. Students and intelligent services in the teaching curriculum model of intelligent service aided design, which causes teachers and students to be unable to communicate effectively, thus leading to poor teaching quality. In addition, teaching methods are also very different. At present, the "indoctrination" classroom instructional patterns is very unfavorable to students. Secondly, there are problems in the current multimedia courseware making. Most of the time, the multimedia courseware is too gorgeous to distract students from the classroom. Moreover, the amount of design knowledge is too large, and it is easy to lack the core. The curriculum arrangement is not scientific enough. The last part is the review after class. Generally, there is a lot of knowledge in classroom teaching. It would be unrealistic

to digest all that students have learned in a short period of time, which ensures coherence inside and outside the classroom. The review method after class becomes particularly important. However, in the current situation, few teachers can effectively solve this problem, which is a pressing issue that needs to be addressed in the teaching of software today.

2.3. Overview of Human-computer Interaction in the Intelligent Era

2.3.1. Overview of Human-computer Interaction. With the birth of computer, HCI technology has also been born. Because of the development of AI, virtual reality technology and other technologies, the communication between human and machine has gradually changed from computer to artificial. This is mainly due to the development of the technology of extracting, detecting and recognizing biological information, the breakthrough of some algorithms in machine learning, artificial intelligence, image processing and other fields, and the application of more intelligent HCI technologies. The HCI technology based on intelligent technology has made great progress, while the traditional remote controller, keyboard, mouse, etc. can no longer meet this requirement. People urgently require less restrictive, more comfortable, and more natural interaction technology. Speech recognition, gesture recognition, iris recognition, line of sight analysis and other new generation of intelligent interaction technologies are gradually maturing, and have been used more and more. In face recognition, iris recognition, line of sight analysis and other technologies, accurate pupil location is essential. Because of its natural, comfortable, rich and other characteristics, its application in the field of HCI has been paid more and more attention, and has gradually become the current research focus. The gesture recognition technology has been made into a gesture control device for 3D game control and multimedia entertainment center, which uses gesture recognition to achieve predetermined tasks. In addition, it can also help deaf people to translate sign language, so that they can communicate with ordinary people without any problems. It can also use its non-contact characteristics to achieve long-distance, digital sand table and other functions. The application of HCI is shown in Figure 3.

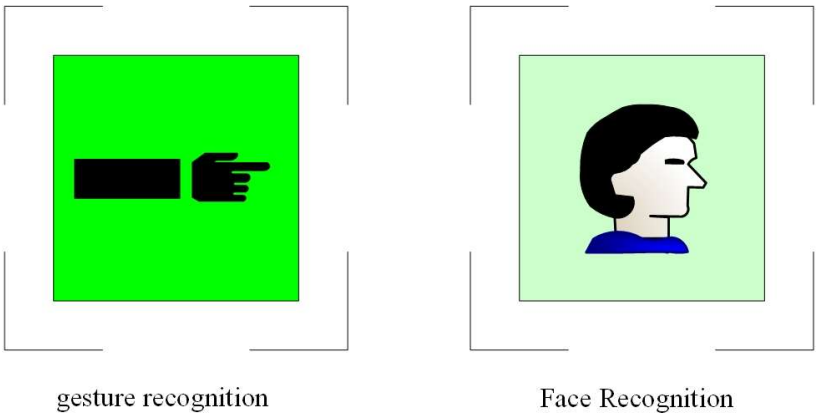

Fig. 3. Human computer interaction for gesture recognition and face recognition

2.3.2. Course Design of Human-computer Interaction Intelligent Service in Intelligent Era. The intelligent service course of HCI can be optimized from the following aspects. First of all, to ensure communication between faculty and pupils, teaching software is essential. To cultivate a good relationship between faculty and pupils, the application of teaching software is also required. Secondly, to make the communication between faculty and pupils better and to promote pupils' learning more effectively, it is necessary to establish a perfect multimedia teaching system, so that students can fully preview and practice outside the classroom. Therefore, teachers create a video teaching system based on the teaching content for the students to preview in class or after class. If

there are problems after class, the teacher can also guide and explain through the video system. The teacher student interaction mode under HCI is shown in Figure 4.

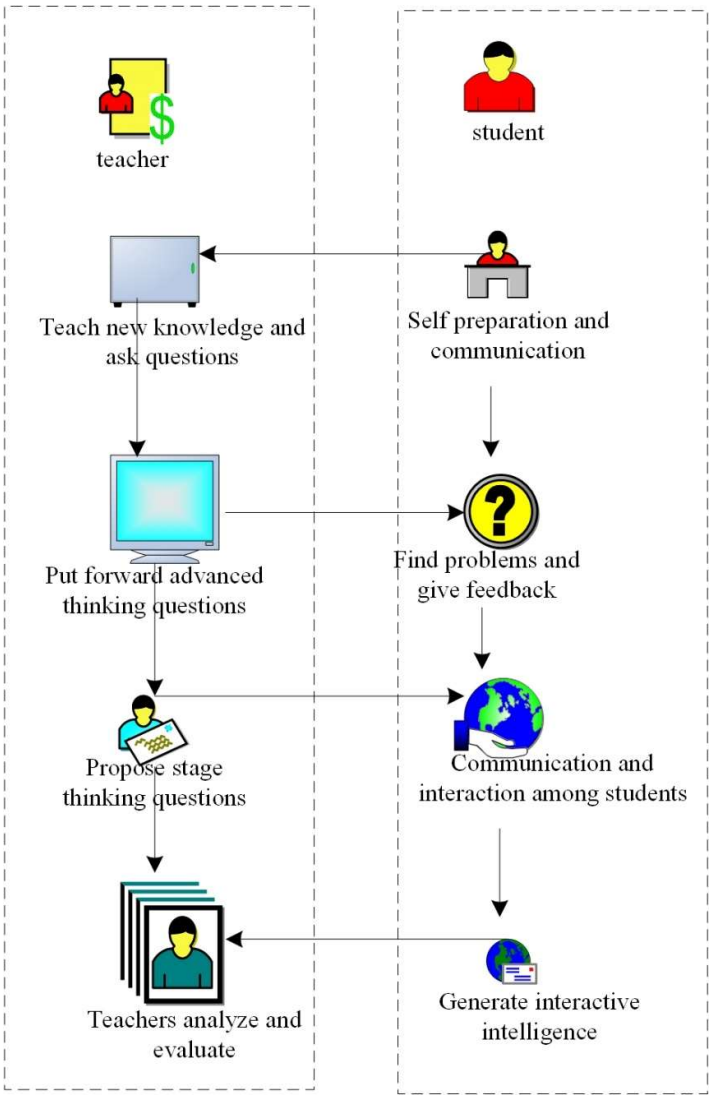

Fig. 4. Interaction mode in teacher and student curriculum teaching

2.3.3. Implementation of Human-computer Interaction Algorithm. Recently years, with the continuous development of various HCI technologies, HCI based algorithms have received extensive attention and become a hot research topic. In computer aided instruction, based on intelligent algorithm, the course instructional patterns under HCI is constructed to improve the teaching quality. Intelligent grouping algorithms are an important part of improving the management of student information in the course instructional patterns. In the traditional teaching method, the test paper generation method adopted has very low scalability. It is time-consuming, labor-intensive, and high investment, but it cannot obtain teaching returns. However, the introduction of intelligent test paper generation algorithm into the course teaching design can effectively solve many problems such as low quality and long time of test paper generation in the past. The intelligent test paper generation algorithm is introduced into the course teaching design, which does not completely deny or abandon the traditional test paper generation method, but fully analyzes the advantages and disadvantages of the traditional test paper generation method. By looking at the problem objectively, rational analysis is carried out.

In the design of target teaching curriculum, it is assumed that the target teaching curriculum includes module a, constraint index b, and the expression matrix of the model is $a*b$. The opposite definition of $a*b$ matrix is:

$$G_h = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1b} \\ x_{21} & x_{22} & \cdots & x_{2b} \\ \cdots & \cdots & \cdots & \cdots \\ x_{a1} & x_{a2} & \cdots & x_{ab} \end{bmatrix} \tag{1}$$

The above target matrix shall meet:

$$\sum_m^n P_{4m} x_{4m} = Q_t \tag{2}$$

Among them: $\sum_m^n P_{4m} x_{4m} = Q_t$ - knowledge point constraint; $P_{4m} = \begin{cases} 1 \cdots x_{4m} = k \\ 0 \cdots x_{m4} \neq k \end{cases}$.

$$\sum_m^n Q_{3m} x_{m3} = S_q \tag{3}$$

Among them: $\sum_m^n Q_{3m} x_{m3} = S_q$ - capability level constraints, $Q_{3m} = \begin{cases} 1 \cdots x_{m3} = q \\ 0 \cdots x_{m3} \neq q \end{cases}$.

These constraints define the knowledge point constraints and ability level constraints of the goal teaching curriculum from a mathematical perspective. Under different constraints, other constraints are defined by users themselves. According to the mathematical model, through the analysis of goal teaching, it is concluded that the problem of generating test paper is solved on the basis of multi factor constraints. Intelligent test paper generation is the process of seeking the global optimal and unique solution. At the same time, computer software and hardware technology and artificial intelligence technology have also entered the era of rapid development. Intelligent algorithm has also become one of the hot spots of current research. Its calculation method is rational and scientifically sound, which can effectively improve the efficiency of computer. GA is a kind of evolutionary algorithm based on genetic mechanism, which has good theoretical and practical significance. GA has three basic operators: choice, intersection, variation and other genetic operators. The specific flow chart of genetic algorithm (GA) is shown in Figure 5.

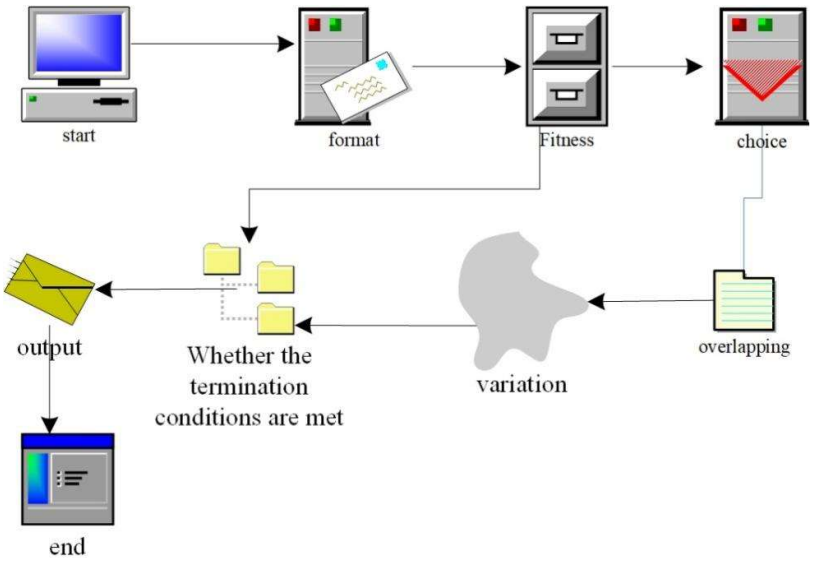

Fig. 5. Genetic algorithm flow chart

Because the fitness function is used to different extent in practical problems, the calculation method of the fitness function is also different. The quality of its design is directly related to the performance of the GA. Generally, there are the following conversion methods. The expression method is used to express the objective function. The specific formula is as follows:

$$G(c) = g(c) \tag{4}$$

This method has good practicality, but its value can be positive or negative. If it is a negative value, its overall performance suffers significantly. At the optimal solution, the fitness and objective functions can be transformed into the following form. The minimum value of $W_{\min}$ is used to represent the objective function.

$$G_{\max}(c) = \begin{cases} g(c) - W_{\min}, \cdots g(c) > W_{\min} \\ 0, \cdots other \end{cases} \tag{5}$$

$W_{\min}$ can be a minimum objective function value or an external input value.

The optimal value and the number of iterations are shown in Figure 6.

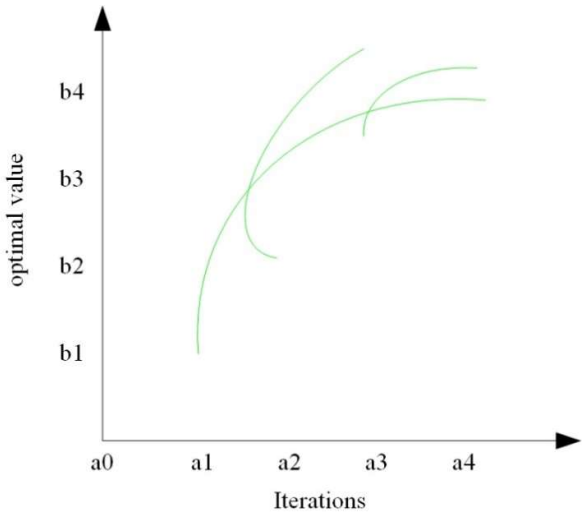

Fig. 6. Variation curve of optimal value and iteration times of genetic algorithm

For the minimum optimization problem, it can be combined with the objective function to obtain the maximum optimization objective function. Among them, $W_{\max}$ represents the maximum value of the objective function estimation.

$$G_{\min}(c) = \begin{cases} W_{\max} - g(c), \cdots g(c) < W_{\max} \\ 0, \cdots other \end{cases} \tag{6}$$

This method improves the direct method, but sometimes it is difficult to determine the appropriate value. In the optimal solution problem, the optimal solution function can be converted to the optimal solution. The formula is:

$$G_{\max}(c) = \frac{1}{D - g(c)} \tag{7}$$

For the optimal solution problem in the minimum value, the objective function and fitness function can be transformed. The formula is:

$$G_{\min}(c) = \frac{1}{D + g(c)} \tag{8}$$

Among them: D - the expected objective function value obtained, which ensures that the denominator of both formulas is positive.

Then, GA and intelligent test paper GA are combined to test the discrimination, validity and reliability. The specific formulas are:

$$T = \frac{C_r - C_v}{B} \tag{9}$$

$$s = \frac{\sum_{m=1}^{i}(C_m - \bar{C})(H_m - \bar{H})}{iZ_cZ_h} \tag{10}$$

$$F = \frac{i}{i-1}(i - \sum_{m=1}^{i}\frac{Z_m^2}{Z^2}) \tag{11}$$

Among them: C_r - Average score of high group;

C_v - Average score of low group;

T - Total score of teaching courses;

s - Validity coefficient of teaching curriculum;

i - Number of students tested;

$Z_c, Z_h, \bar{C}, \bar{H}$ - Mean square deviation and mean value of two teaching course tests;

F - Reliability of teaching courses;

Z^2 - Total score variance of teaching course test.

The results show that the method can solve optimization problems under multi-objective and multi-constraint conditions. The intelligent grouping of volumes in this scheme is an improvement of this algorithm. The improved method has been adjusted in terms of group initialization. Dynamic crossover and mutation probability is adopted to avoid premature convergence and accelerate the search speed and performance.

3. Demonstration of the Course Teaching Mode of Intelligent Service Aided Design Based on Human-computer Interaction in the Intelligent Era

Through the analysis and discussion of HCI and course instructional patterns under computational intelligence, based on this, a course teaching model of intelligent service-assisted design with HCL in the age of intelligence" is proposed to further improve the existing instructional patterns. At the same time, the effectiveness of this method is studied empirically.

3.1. Method of Intelligent Service Assisted Curriculum Teaching Mode of Human-computer Interaction in the Intelligent Era

In order to verify the feasibility of the instructional patterns of intelligent service aided design course of HCI under computational intelligence, this paper selects two classes from a local middle school to teach them respectively. There are 60 students in both classes. Class A students are the traditional instructional patterns of intelligent service aided design. Class B is an intelligent service aided design course instructional patterns of HCI in the intelligent era. After four months of teaching, a questionnaire survey is conducted. The differences between teachers and students under the two methods are compared, and finally a conclusion is drawn.

3.2. Course Teaching Results in Two Different Ways

3.2.1. Comprehension and Comparison of Teaching Content. Teaching content is an essential indicator of the effectiveness of the course, and also an important standard to test the teaching effect. The understanding of teaching content in the two ways is shown in Figure 7.

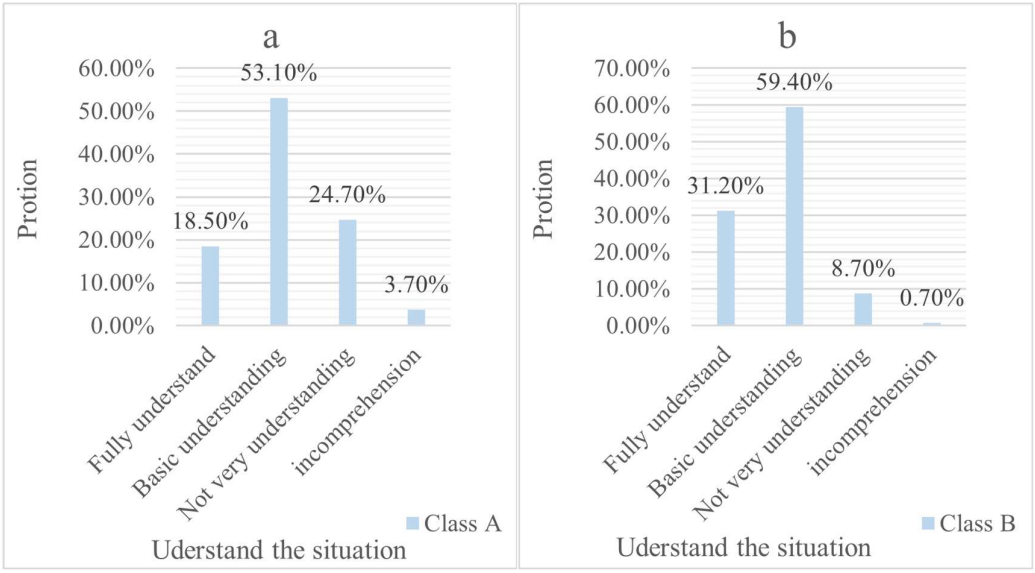

Fig. 7. Comparison of students' understanding of classroom teaching content

Figure 7 (a): The students' understanding of the teaching content of Class A under traditional methods.

Figure 7 (b): The students' understanding of the teaching content of Class B under the method of this paper.

It can be seen from Figure 7 (a) and Figure 7 (b) that students in Class A have a worse understanding of the teaching content than students in Class B. Only 18.5% of students in Class A fully understand the teaching content, while 3.7% of students do not. 31.2% of students in Class B can fully understand, which is 12.7% higher than that in Class A, while students who do not understand are 3% lower than that in Class A. This shows that the teaching curriculum design of this method is more conducive to students' understanding of the teaching content, which promotes students to master knowledge and improve the teaching effect. At the same time, the teaching content design in this method can also better enable teachers to pay attention to all students. A variety of strategies are implemented to ensure that the teaching content is better absorbed by students. For the advantages of this method, the results of the student questionnaire are shown in Table 1.

Table 1. Advantages of this method

Serial No	Advantage	Number of people	Proportion
1	The teaching is targeted and the key and difficult points are prominent	16	26.67%
2	Can attract students' interest	12	20%
3	Timely consolidate the classroom content and improve the learning efficiency	18	30%
4	Timely feedback after class, personalized tutoring after class	14	23.33%

It can be seen from Table 1 that the impact of this method on the teaching content mainly lies in the pertinence of teaching and the improvement of learning efficiency, which may also be an important reason to promote the students of Class B to understand the teaching content.

3.2.2. Teaching Satisfaction Results. The measurement of whether the instructional patterns has the popularization and application value mainly lies in the comparison of the satisfaction of course teaching. The satisfaction of course teaching in the two ways is shown in Figure 8.

Fig. 8. Comparison of students' satisfaction with the teaching model between the two classes

Figure 8 (a): The teaching satisfaction of Class A students under the traditional method.

Figure 8 (b): The teaching satisfaction of Class B students under the intelligent service aided design method in this paper.

A comparison of Figure 8 (a) and Figure 8 (b) shows that only 15.4% of the students in Class A are completely satisfied with the course instruction, while 35.1% of the students in Class B say they are completely satisfied. Compared with Class A, the proportion of Class B fully satisfied increases by 19.7%, while the dissatisfaction decreases by 7.4%. This shows that the curriculum instructional patterns under the method of this paper can promote the students' satisfaction with curriculum teaching. The course instructional patterns of intelligent service aided design through HCI in the intelligent era can better improve the satisfaction of students for the application of software and hardware.

In addition to the comparison of students' satisfaction in classroom teaching, the satisfaction of teachers' teaching needs in the teaching process is also investigated. The teaching satisfaction of the two methods is shown in Figure 9.

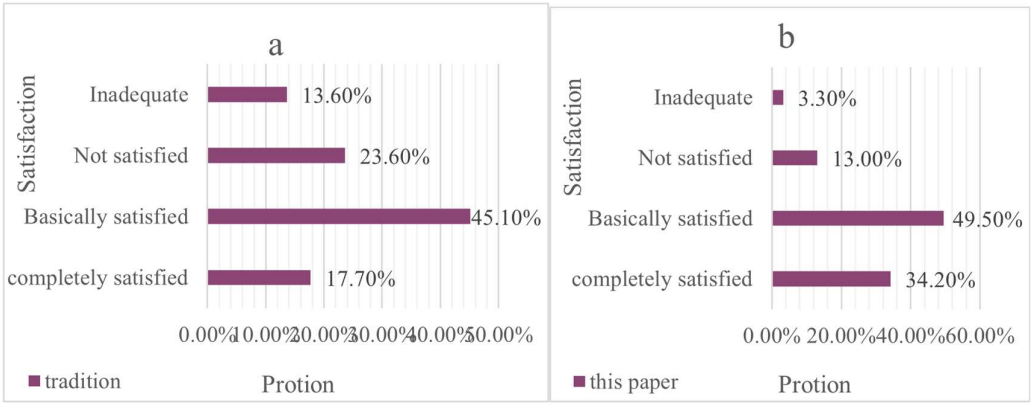

Fig. 9. Satisfaction of teachers' teaching needs

Figure 9 (a): The satisfaction of teachers' teaching needs under traditional methods.

Figure 9 (b): The satisfaction of teachers' teaching needs under the intelligent service aided design method in this paper.

It can be seen from Figure 9 (a) and Figure 9 (b) that only 17.7% of teachers think they can meet the teaching needs under the traditional method. The method in this paper is 34.2%, which is 16.5 higher than the traditional method. For the part that can not meet the requirements at all, the method in this paper reduces by 10.3% compared with the traditional method. This shows that the

use of this teaching method can better advance teachers' classroom teaching and improve teaching effectiveness.

3.2.3. Comparison of Teaching Results. Any new instructional patterns is intended to improve the teaching effect. The comparison of the improvement of teaching effect under the two methods is shown in Figure 10.

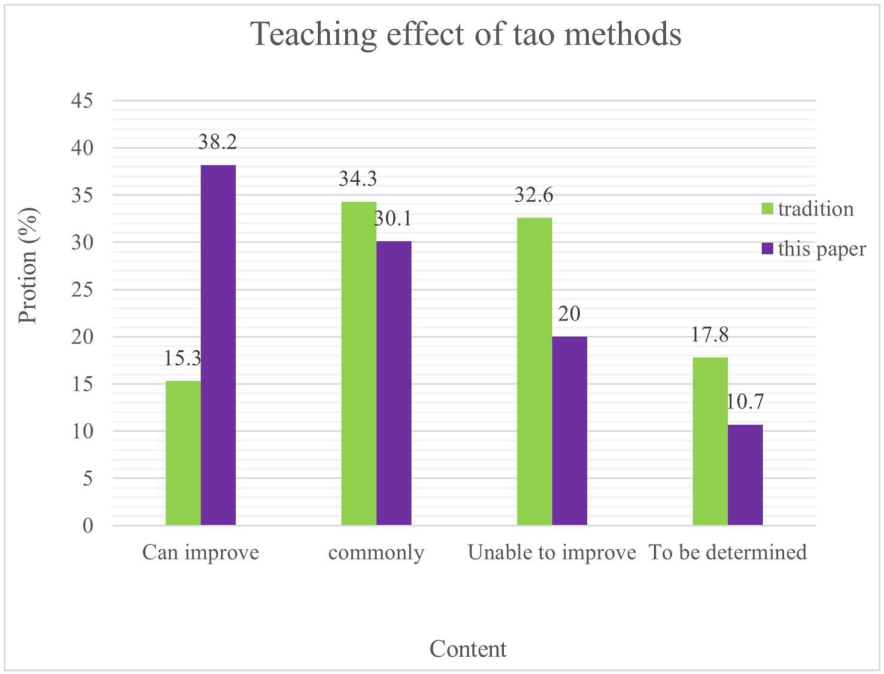

Fig. 10. Comparison of teaching effects between the two methods

As can be seen in Figure 10, 38.2% of the students in this study believe that this model can improve the effectiveness of the classroom. However, only 15.3% of the students think the traditional method can improve, 22.9% higher than the traditional method. This may be because the classroom instructional patterns under this method gives students confidence, arouses students' enthusiasm, and makes the classroom effect better. Finally, it is used in teaching effect to promote the improvement of teaching effect. In addition to the investigation of teaching effect on the students of two classes, the investigation of students' ability change on the students of Class B is also carried out. The specific investigation results are shown in Table 2.

Table 2. Investigation on the change of students' ability in Class B

Serial No	Capability improvement change	Number of people	Proportion
1	The ability to consolidate and digest past knowledge	12	20%
2	Ability to understand current knowledge	10	16.67%
3	Learning enthusiasm	10	16.67%
4	Team cooperation ability	15	25%
4	Divergent thinking and pioneering ability	13	21.66%

It can be seen from Table 2 that the method in this paper plays an obvious role in promoting team cooperation ability, divergent thinking ability, and knowledge understanding and consolidation. This means that the introduction of intelligent service aided design course instructional patterns with intelligent HCI can have a greater impact on teaching. In this way, the overall quality of students and create favorable conditions for their overall development can effectively be improved.

To sum up, through the research on the instructional patterns of intelligent service aided design of HCI under computational intelligence, it is found that the method provided in this paper is 12.7% higher than the traditional method in promoting the understanding of teaching content, and 19.7% higher than the traditional method in terms of the complete satisfaction of course teaching. The teaching effect is 22.9% higher than that of traditional teaching. This indicates that the methodology of this study is effective in improving pupils' comprehension of the content and increasing their satisfaction with the course, which ultimately improves the teaching effect of students. It can not only promote students' development, but also improve their abilities in all aspects. At the same time, in addition, in the computer intelligence environment, the use of HCI to achieve intelligent service-assisted design of course instructional patterns can better adapt to the teaching needs of teachers and improve their teaching level.

4. Conclusion

With the development of computational intelligence, HCI can be applied in more fields. This article studied the instructional patterns of intelligent service aided design of HCI in the intelligent era. First of all, the relevant background of the article was briefly introduced. After that, the deficiencies of previous scholars' research was analyzed. Thirdly, through theoretical analysis, the method of intelligent service aided design for HCI in the intelligent era was proposed. Practical validation of this approach has shown that it better promotes pupil comprehension, increases teacher satisfaction, and leads to significant improvements in the quality of faculty teaching compared to traditional teaching methods. In the meantime, the application of intelligent service aided design for HCI under computational intelligence could also better improve teachers' teaching needs and improve teaching efficiency.

Funding

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