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An application of Web-based college online English teaching platform

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ABSTRACT

With the advancement of science and technology, the society's knowledge level and breadth of requirements for students are becoming increasingly broad. It is far from satisfying students' social development needs to rely solely on what they learn in class, so it is critical and necessary to cultivate students' ability to learn independently. The design and implementation of a Web-based English self-help learning system provides a platform and motivation for students to learn independently. Measures and countermeasures should be taken to improve college English reading teaching, such as updating ideas, changing traditional teaching mode, utilizing various information resources, maximizing students' background knowledge, training students' reading strategies and skills, guiding students to expand extracurricular reading, and attaching importance to students' dominant position. Network teaching adapts to this necessity and is quickly applied to English instruction, thanks to the rapid growth and popularization of information technology and Internet technology. The hardware construction of the university campus network has reached a significant scale, and the equipment is in great working order. However, its application is relatively weak, especially the relative lack of teaching resources, there is a widespread phenomenon of roads without cars. According to the characteristics of English teaching, this paper puts forward a set of college English auxiliary teaching systems based on WEB, aiming at expanding the learning resources on-campus network, improving students' learning level, and giving full play to the application of campus network.

Keywords: Web, Teaching system, English Teaching Platform

1. Introduction

As the depth of campus network construction increases, so does the demand for campus network applications. How to effectively use the campus network this platform, as well as rich hardware resources, to carry out network-assisted teaching and get the most out of network resources has

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become a hot topic among campus network builders. The hardware construction of the campus network is now improving day by day, and the network's frame structure is rather obvious [1]. Taking college English teaching as an example, while there is some multimedia teaching software and resources for students to use on some campus networks, they are only rigid listening and watching operations, unable to give play to teachers' and students' subjective initiative, and unable to reflect individual needs. The experience demonstrates that college English is a practical subject that falls short of meeting the instructional demands of students in the classroom [2]. As a result, an appropriate auxiliary teaching system must be developed, not only to liberate instructors, but also to promote students' self-study and increase the campus network's teaching resources. Based on analyzing the characteristics of college English teaching, this paper makes a systematic study of the auxiliary teaching system [3].

There has been a wave of reform in the field of foreign language instruction in China in recent years. The hot and challenging topics in foreign language teaching reform are attracting the attention of an increasing number of foreign language teachers. Setting up foreign language courses, updating teaching materials and content, connecting middle school and college foreign language teaching, quality education and foreign language teaching, creating a foreign language teaching environment, reforming foreign language teaching methods and methods, and so on. One strategy to address these issues is to make full use of the Internet's vast resources, create English websites, and conduct net-assisted English instruction [4-7].

Network multimedia education has become an essential aspect of college English teaching reform in higher vocational institutions, thanks to the fast growth of information technology. Various commercial English learning websites, semi-commercial English learning websites, and non-commercial English learning websites, as well as English learning websites independently established by colleges and universities and higher vocational colleges, have been constantly emerging on the Internet due to the continuous deepening of English teaching reform [8].

Curriculum arrangement is an important issue in computer science (CS), operations research (OR), artificial intelligence (AI) and other fields. Curriculum scheduling problem is a special resource scheduling problem, which has been proved to belong to polynomial time solvable problem class of nondeterministic algorithms (NP). The curriculum is allocated to a limited number of teachers, courses, teaching venues and teaching time. Colloquially, it refers to the allocation of classrooms, time, teachers, etc., and the meeting of some specific requirements for school courses. Traditional course arrangement is carried out manually, which is time-consuming, inefficient and successful, and has a high resource conflict rate [9]. It involves a large number of reconstruction Settings of problems to find a compromise solution, which cannot cope with the requirements of modern teaching management and scheduling. With the expansion of college enrollment scale and campus expansion, the number of students increases year by year, the continuous increase of majors, and the continuous improvement of teaching infrastructure, it has increased the difficulty of curriculum arrangement as one of the routine management items of educational affairs. The realistic curriculum arrangement is multi-dimensional, combined and dynamic. Different universities have different situations and different variables. Therefore, curriculum arrangement is a highly constrained problem [10]. College curriculum arrangement is carried out in a huge search space environment. With the increasing number of students and courses, there is a great need for resource (manpower, time and space) optimization. With the help of computer curriculum arrangement, save manpower and time, reduce conflict rate, improve satisfaction. The core of curriculum arrangement in colleges and universities is conflict and preemption of multiple resources, which is a reference for solving similar problems such as arrangement of examination rooms, seating arrangement of cinemas and scheduling of airline routes [11].

2. Related work

2.1. Research Status

The main purpose of the research and design of network teaching is to construct the design of a learning environment, the design of shared learning, and the design of collaboration. That is to say, at present, the research on network teaching infrastructure, teaching resources, and other aspects are still in the initial stage, and more staff are needed to research, develop and explore. For example, in the network environment, how to use the virtual situation for inquiry learning, how to use network resources for independent learning, how to use tools for creative learning, how to use teachers' teaching activities for learning and other aspects are the direction of our future research [12-14].

With the advancement and popularization of computer technology, network teaching has become an increasingly important teaching means and teaching location. However, when compared to traditional teaching, all aspects of network teaching (such as the quality assurance system) are not perfect and sound traditional teaching. As network teaching becomes increasingly significant, issues such as how to secure a quality network teaching system, how to build and perfect an effective network teaching assessment model, and so on have arisen as a result of network teaching. At home and abroad, no institution can give a detailed description of how to organize and evaluate network teaching, how to obtain teaching resources, and how to promote teaching links, and can only give a general description of network teaching. And the learning evaluation module in the support platform of network teaching often only contains the test part but lacks the corresponding analysis and feedback [15].

Intelligence Computer Assisted Instruction (ICAI) is an advanced form of traditional CAI, which is based on constructivism learning theory. In this kind of teaching system, the introduction of advanced artificial intelligence technology, set up the learning process of the intelligent diagnosis mechanism, make the teaching courseware has certain "thoughtful", change traditional teaching way, mechanization, CAI courseware modeled by the past teaching content into a one-way transmission according to the teaching contents of two-way teaching for the corresponding teaching strategies. According to the cognitive model established by each student, ICAI determines students' learning level, learning progress, and mastery of course content, searches, judges and makes decisions through an intelligent analysis system, and dynamically generates learning strategies corresponding to it, to arrange teaching content and teaching progress more reasonably. On the learning process of students' mistakes, through the intelligent diagnosis mechanism for dynamic analysis, analysis of the cause of the error, provide a reasonable improvement plan, at the same time modify the original learning strategy; ICAI can also conduct distributed statistical analysis on the errors or common problems frequently encountered by all students in the learning process, form teaching guidance programs, provide the basis for teachers and educational administration staff to adjust and improve teaching courses, test the difficulty of question types, and provide decision-making suggestions for the setting of relevant courses [16-19].

2.2. System architecture design

The system follows a three-layer WEB architecture, which includes:

Presentation Layer (UI): The user interface is built using ASP.NET WEB application development, with the client accessing it through the IE browser.

Business Logic Layer (BLL): This layer handles the core business processing and data transfer, including operations and logical judgments related to the database. The system's evaluation process is also managed within this layer.

Data Access Layer (DAL): Responsible for accessing the database, this layer provides data to the business logic layer and interacts with the database based on the passed parameters. It uses ADO.NET data adapters and SQL server stored procedures for database operations in ASP.NET.

This structure offers advantages such as ease of operation, convenient maintenance, and a short information processing cycle, as illustrated in Figure 1.

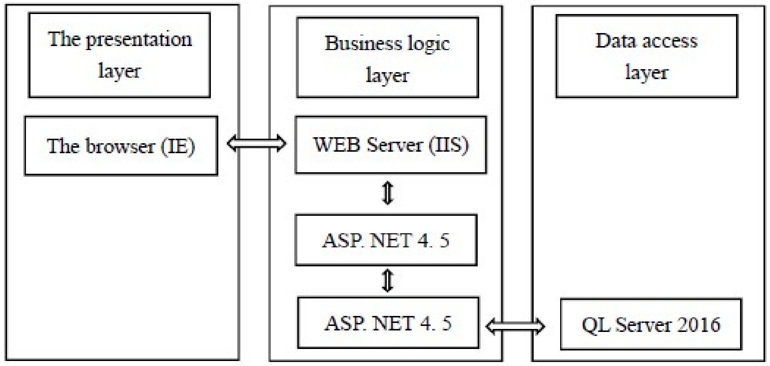

Fig. 1. Three-layer architecture of the system

According to the requirements, the system is divided into four modules, which are the system management module, learning evaluation module, role management module, and personal information module, as shown in Figure 2.

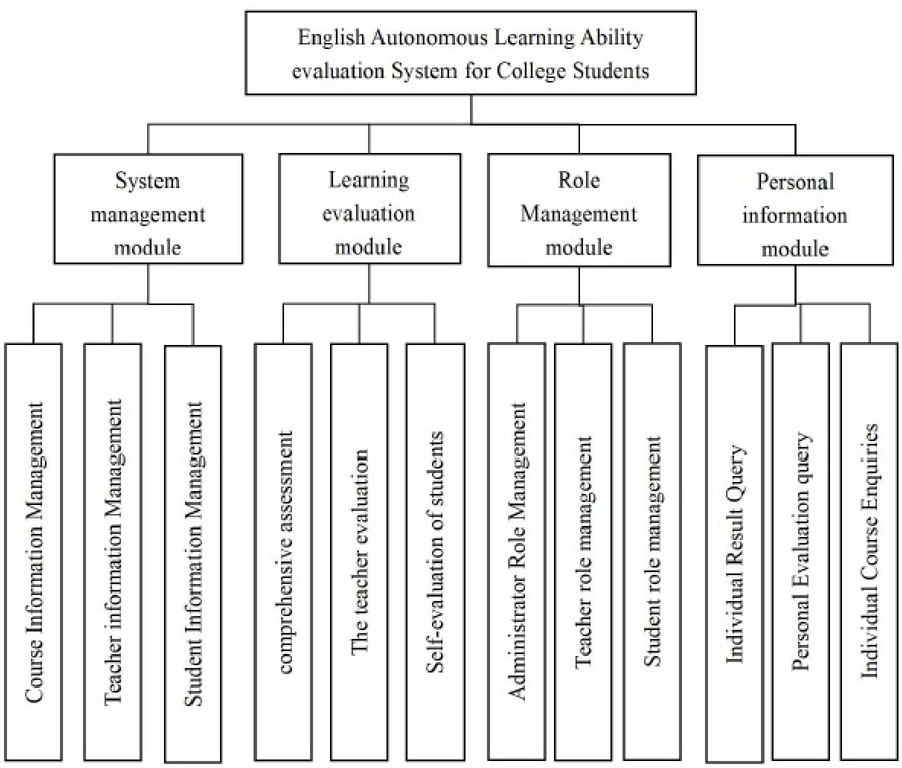

Fig. 2. System function modules

1) System management module: the main function of this module is to manage student information, teacher information, and course information.

2) Learning evaluation module: this module is the core part of the whole evaluation system, and the main function of student self-evaluation is that students can evaluate their English self-study status according to the independent learning evaluation system. The main function of student

evaluation is that students evaluate the status of self-study of assigned classmates according to the self-study evaluation system.

The function of teacher evaluation is that the teacher evaluates each student of the class. The main function of achievement synthesis is that the system carries out the comprehensive calculation and gives the evaluation results of each student according to different weights according to the results of self-evaluation, other evaluation, and teacher evaluation.

3) Role management module: The main function of this module is to set the role of the user, the role represents the permission, different roles access the system, the use of the function is different.

4) Personal information module: The main function of this module is the management of students' and teachers' personal information, personal course inquiry, evaluation inquiry, evaluation results inquiry, etc.

At present, the intelligent method has been widely used in the paper formation and achieved good results. Genetic Algorithms, for example, can better match the needs of autonomous paper generation due to their benefits of adaptive global optimization and intelligent search technology. Because the two sets of randomly selected papers may have the same questions, if the hybrid operator in the traditional genetic algorithm is used, it is necessary to check the sub-individuals generated by repeated questions, which reduces the algorithm's efficiency, so the hybrid operator's function is not considered in the design. Furthermore, taking into account target value deviation and constraint conflict, the multi-point mutation operator developed in this study can match the objective criteria of paper formation convergence speed and quality.

For a high-quality examination paper, we must consider many factors, mainly including topic difficulty, topic distinction, topic exposure, topic coverage (test chapter distribution and knowledge distribution 1, topic inspection level, topic reuse, problem-solving time, etc...

For test question I, n indicators are needed, which are assumed as n-dimensional vectors (question type AI1, total score AI2, estimation time AI3, knowledge classification AI4, difficulty AI5, differentiation AI6, ability level AI7...). Aijisthe j-th index of the problem i. Thus, for a test paper containing m, its test question attributes can be represented by an $m*n$ matrix as follows.

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix} \tag{1}$$

In the command, m is the number of test questions, and n is the number of test indicators.

The main index constraints of the test paper are described as follows:

1) Constraint on the total score of test questions

$$\sum_{i=1}^{m} score_i = K \tag{2}$$

Where, the score is the score of question i, K is the total score of the test paper. Similarly, the score of each item type can be obtained according to the type of each item.

2) Knowledge constraints

Knowledge point constraint refers to the number of knowledge points contained in the test paper and the proportion of each knowledge point in the total test paper. Assume that all questions in the question bank have N categories according to knowledge points. For a set of papers, not only pay attention to the number of knowledge points contained in a set of papers but also pay attention to the proportion of some knowledge points in the papers.

$$\sum_{i=1}^{m} f(kp_i) \geq k \tag{3}$$

Among them, F (KPI) is 1 or 0 according to whether the knowledge point of sub - question i have been included in this paper. The value is 0 if the knowledge point of the i subquestion is included; the value is 1 if it is not included, and the knowledge point is added to the knowledge point set of the test paper.

For the i problem, if it's in the $j(1 \le j \le N1)$ key assessment knowledge points, then:

$$sum[j] = sum[j] + score_i \tag{4}$$

After calculating all key assessment knowledge points, we can calculate the proportion of each key assessment knowledge point in the whole set of papers N_j.

$$\eta_j = \frac{sum[j]}{K} \tag{5}$$

To each kind of key assessment knowledge point. It should satisfy:

$$\eta_j \ge g_j \tag{6}$$

where g_j is the proportion of key assessment knowledge points of class j given.

Difficulty constraint refers to the overall difficulty coefficient of the paper, which is a weighted average of the difficulty of all the questions in the paper.

$$\left|coff\_dif - coff\_dif_0\right| = \left|\sum_{i=1}^{m} \frac{score_i * coff\_dif}{m * K} - coff\_dif_0\right| \le \varepsilon \tag{7}$$

where $coff\_dif$ is the difficulty coefficient of a given paper, and ε is a given smaller decimal. The above formula indicates that the deviation between the difficulty coefficient of the generated test paper and the given difficulty coefficient should be controlled within a small established range.

The time required to complete question i is t_i, then the estimated time for the whole volume is:

$$T = \sum_{i=1}^{m} t_i \tag{8}$$

The time limit refers to the maximum time it takes to complete all the questions in the solution paper. Under normal circumstances, the answer time can be satisfied within the normal examination time range.

The automatic volume formation problem is essentially a multi - constraint objective optimization problem, and the solution satisfying the constraint condition is not unique. There may be some errors in the examination points, the degree of difficulty, and the total time. In practical application, the importance and character of each constraint condition are different, so the objective function takes the weighted sum of the errors. The objective function F can be expressed as:

$$F = \sum_{i=1}^{n} f_i x_i \tag{9}$$

In order not to make the errors cancel each other, the errors between the actual value and the required value are taken as absolute values. And x_i is the weight of the ith constraint,

$$\sum_{i=1}^{n} x_i = 1 \tag{10}$$

According to Equation (9), the smaller the target function F value is, that is, the smaller the error is, the better the solution of the problem obtained by the algorithm is, that is, the closer the generated test paper is to the user's demand.In the course arrangement problem, the variable is course Si, the variable domain is feasible time file T(Si) and classroom R(Si), and constraint C(Si) is the relationship between variables. The solution of the curriculum scheduling problem can be defined as assigning time T(Si) and classroom R(Si) to the curriculum Si taught by a teacher I(Si) and satisfying certain constraints C(Si).

Constraints play an important role in constructing a workable and optimized curriculum.

1) The timesheet and classroom assigned to the course must be selected from the timesheet and classroom domain.

$$(\forall i)\exists(t \in T(S_i))(\delta_i = t) \tag{11}$$

$$(\forall i)\exists(t \in R(S_i))(\varepsilon_i = t) \tag{12}$$

The time slots and classrooms assigned to the course i are represented by δ_i and ε_i respectively.

2) If a teacher teaches more than one course, no teacher can assign more than one course to a teacher at the same time.

$$\forall(I(S_i) = I(S_j))\exists(T(S_i) \neq T(S_j)) \tag{13}$$

Courses S_i and S_j cannot be taught at the same time because they are taught by the same teacher.

3) A group of students cannot be assigned to more than one course at a time.

$$\forall(G(S_i) = G(S_j))\exists(T(S_i) \neq T(S_j)) \tag{14}$$

The class time $T\left(S_i\right)$ of course S_i cannot be the same as the class time $T\left(S_j\right)$ of course S_j because they belong to the same group of students.

4) One classroom cannot be allocated to more than one course at the same time.

$$\forall(R(S_i) = R(S_j))\exists(T(S_i) \neq T(S_j)) \tag{15}$$

5) The number of students in the classroom should not be less than the number of students in class.

$$\forall(R(S_i) = t_k)\exists(Z(R(S_i)) \geq N(S_j)) \tag{16}$$

$N\left(S_i\right)$ refers to the number of students attending the course S_i.

6) Certain time slots are reserved for special events E, such as teachers who have specific requirements for time slots.

$$\forall(t_j = E)\exists(T(S_i) \neq t_j) \tag{17}$$

7) Some classrooms are reserved for specific events F, such as teachers who have specific requirements for the classroom.

$$\forall(r_j = F)\exists(R(S_i) \neq r_j) \tag{18}$$

3. Experimental results and analysis

An experiment was conducted in a local school to verify the feasibility and accuracy of this method, with 10 English teachers invited to participate. The teaching ability of these teachers was evaluated using this method. The collected data were first discretized, and the results are presented in Table 1.

Table 1. Data after discretization

The evaluation object	B1	B2	B3	B4	B5
1	1	4	1	3	1
2	1	3	3	3	3

3	1	3	3	3	3
4	4	3	3	1	1
5	1	3	1	4	3
6	3	1	1	3	1
7	1	1	3	1	1
8	4	3	3	1	3
9	3	3	3	3	3
10	3	1	1	3	3

The weight was calculated by the method in this paper, and the attribute reduction was completed at the same time. The results were described in Table 2.

Table 2. Weight and reduction results of different indicators

Level indicators	The weight	The secondary indicators	The weight
The teaching of basic Literacy (B1)	5.8	1. Highest degree	0.0875
		2. Level test	0.0327
The classroom teaching Capacity (B2),	30.6	1. Rigorous teaching style	0.0773
		2. Teaching plan preparation	0.0057
The research ability (B3)	11.1	1. Published teaching and research papers	0.1452
		2. Teaching and research awards	0.4275
English major Capacity (B4)	25.4	1. Professional certificates	0.2331
		2. Scientific research awards	0.8127
After-school tutoring	27.1	1. Help answer questions	0.0837
		2. Assign homework	0.0772

The teaching ability evaluation results of 10 English teachers were obtained according to the weights and evaluation data, as shown in Table 3.

Table 3. Evaluation results of English teachers' teaching ability

The evaluation object	B1(5.8)	B2(30.6)	B3(11.1)	B4(25.4)	B5(27.1)	Overall score/point
1	93	95	83	82	96	90.521
2	96	83	72	71	70	75.962
3	89	93	90	90	88	90.318
4	90	83	93	85	90	86.921
5	91	69	68	73	70	71.452
6	81	78	72	73	78	76.238
7	91	90	82	90	81	86.731
8	88	78	88	79	81	80.757
9	89	80	76	77	78	78.774
10	86	62	60	68	69	66.591

Through this method, the teaching ability of school English teachers is evaluated, and the results are as follows: 20% of the teachers with more than 90 points, 30% of the teachers with more than 80 points and less than 90 points, 40% of the teachers with more than 70 points and less than80pointsand10%oftheteacherswithlessthan70points.

The comparison and analysis of this method with the traditional weighted average method and fuzzy mathematics method show the following evaluation results. Using the weighted average method, for 10 English teachers, 40% scored above 90, 40% scored between 80 and 90, 10% scored between 70 and 80, and 10% scored below 70. On the other hand, using the fuzzy mathematics method, the evaluation results showed that 70% of the teachers scored above 90, 20% scored between 80 and 90, 10% scored between 70 and 80, and 0% scored below 70. The results obtained from this method are more fair and scientifically sound.

Compared with the standard PSO algorithm and PSO-LS algorithm, the PSO-FC algorithm takes a little longer time to generate the solution. Because of the need to verify the validity of potential solutions and the backtracking of the occurrence of invalid solutions. The standard PSO algorithm and PSO-LS algorithm can generate the solution more quickly because they accept any solution that does not touch the constraint (does not have the maximum preference value) and does not do any backtracking. So the solution produced by the two is a viable solution. Using the PSO algorithm alone leaves some unassigned courses because it cannot handle the constraints of the course scheduling process. These unassigned courses will eventually need to be programmed manually. The manual arrangement is time-consuming and inefficient.

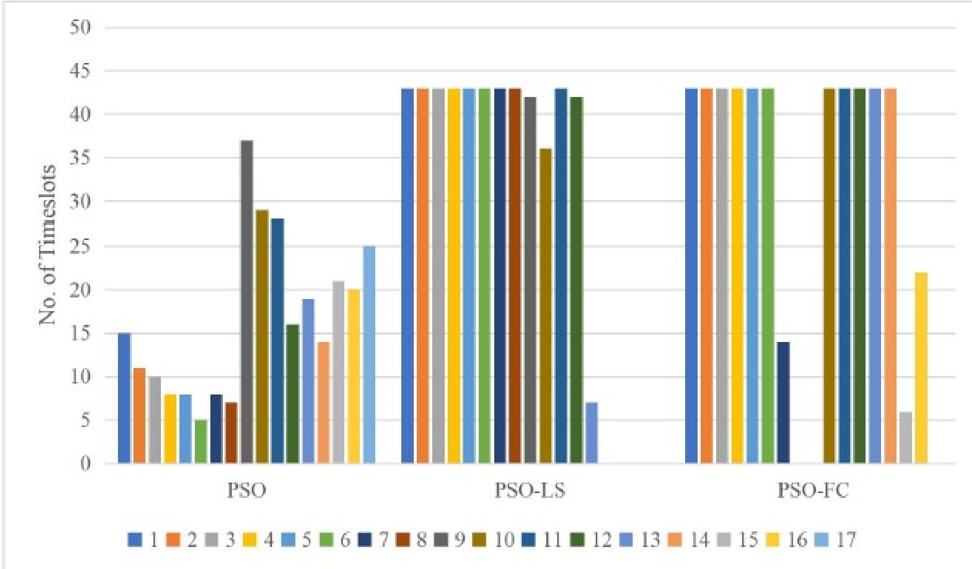

Fig. 3. Time utilization of different algorithms

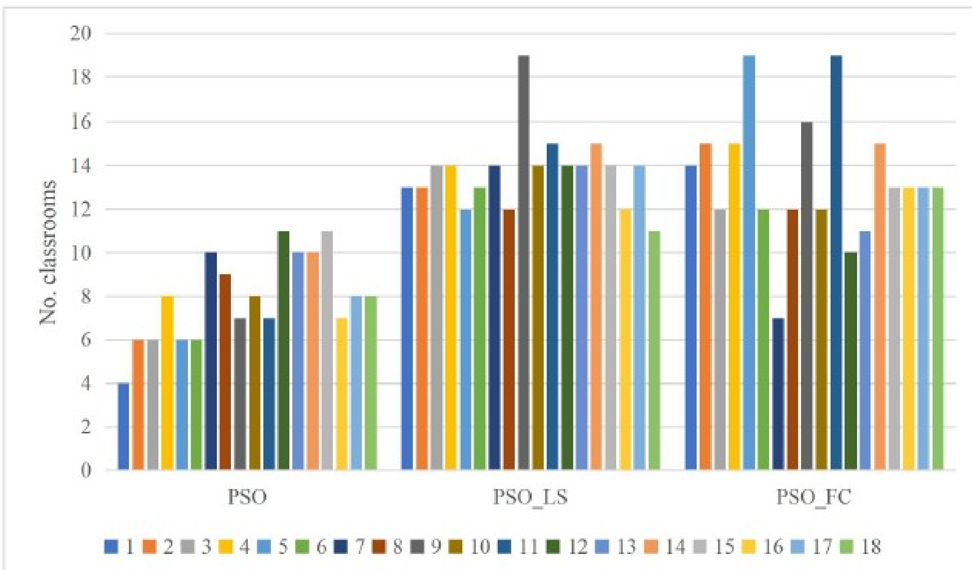

Fig. 4. Classroom utilization of different algorithms

It can be seen from Figure 3 and Figure 4 that by using particle swarm optimization and forward detection algorithm, classrooms and time files with high reference values are allocated to courses before classrooms and time files with low preference values, and classrooms and time with high preference values have high utilization rate. The maximum time profile usage is 43, which is equal to the total number of available time profiles in a week. Since particle swarm optimization with local search has no backtracking ability. If there are no constraints, classes will be assigned. So it doesn't maximize the preference. Using standard particle swarm optimization, some courses cannot be assigned successfully. Because it can't handle constraints. When a conflict occurs, the standard particle swarm algorithm only calculates the unallocated lessons and continues to allocate the remaining lessons, so the time slot utilization is low.

To sum up, the standard PSO algorithm, PSO-LS algorithm, and PSO-FC algorithm can be applied to practical course scheduling. Considering the two factors of running time and adaptive value, the

PSO-FC algorithm is superior to the standard PSO algorithm and PSO-LS algorithm, which can better meet the needs of practical curriculum scheduling.

To evaluate the performance of PSO-FC, it is compared with standard particle swarm optimization (PSO) and integrated local search particle swarm optimization (PSO-LS). Each algorithm was independently run 5 times, and the experimental results were shown in Figure 5.

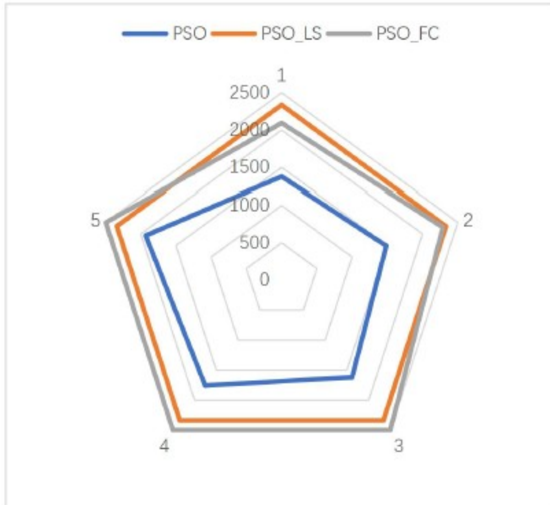

Fig. 5. Results of five runs

According to Figure 5, all three algorithms can produce feasible solutions for course scheduling. In terms of average running time consumption, there is little difference between the three algorithms. However, by checking the maximum value of the average adaptation in PSO-FC and comparing it with that in PSO and PSO-LS, the adaptation value (the teacher's preference value for classroom and time slot) is the maximum. This shows that the PSO-FC algorithm can produce the optimal solution with the best quality.

4. Conclusion

With the expansion of school size and the development of campus network construction, traditional classrooms, regardless of model or method, have shown to be unable to meet the needs of teaching situations. The development of a college English assisted instruction system is an extension and expansion of traditional English teaching, and it is an unavoidable requirement to improve the quality of English teaching. To satisfy the demands of English instructors, the college English auxiliary teaching system aims for tailored instruction, uses contemporary information technology as a means, and uses the convenience of English teachers as the main technology. The practice demonstrates that the creation of this method may significantly improve both student learning and instructor teaching, and is conducive to a comprehensive improvement in English teaching quality. The design and execution of a web-based English online learning system are discussed in this work. Through this system, students can study independently, take tests, and receive feedback in a timely manner. They can adjust their learning progress in a planned, step-by-step, and systematic way, thus improving the efficiency of online learning. At the same time, teachers (or administrators) can use the system to analyze student statistics and provide targeted guidance. The next step is to further improve the statistical analysis function of the question bank and test questions, using the analysis to guide the updating of the question bank, making it more scientific and effective, and thereby enhancing the quality of test paper formation and the effectiveness of online learning.

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