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Research Article

A Chinese Intelligent Teaching Platform for Colleges Based on Cloud Computing

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In China, the Chinese subject is called "the mother of the encyclopedia." Learning Chinese well is the basic condition for learning other subjects well. Therefore, Chinese education has always undertaken the important task of teaching the mother tongue and cultural inheritance and has a great influence on the development process of China's education. Society is facing new opportunities and challenges since the 21st century, and all the mobile Internet, cloud computing, and Internet of Things achieve great development. Using the increasingly mature technology of data information collection, analysis, and processing can realize a more comprehensive evaluation of students in teaching activities. In the current upsurge of big data, it is more and more widely used in the field of education, such as learning analysis, network education platform, education information management platform, education AP, and smart campus. In this context, Chinese teaching needs more open courses, which requires us to organically integrate the existing information technology and Chinese teaching, and on this basis, integrate modern educational data sets and learning analysis technology into Chinese teaching and learning, to promote the improvement of the quality of language teaching and learning. The development of information technology in the intelligent era provides an opportunity for the establishment and application of an intelligent classroom. This paper constructs an intelligent and efficient new classroom equipped with smart devices teaching mode based on defining the concept and connotation of a classroom equipped with smart devices. The proposed model is combined with the current situation and the development of classrooms equipped with smart devices. It also analyzes the difficulties and pain points of traditional College Chinese teaching. The research results can provide a reference for the implementation of intelligent classroom teaching mode in College Chinese and other general courses in higher vocational colleges.

1. Introduction

Culture and education have always been the top priority of social development since ancient times. The people's exploration of all aspects of education has never stopped. Among them, the mother tongue curriculum is the basis of all disciplines in a country and a bridge to other disciplines [1]. Recently, the information technology in the domain of intelligence has achieved sufficiently develop, it finally finds a perfect way to break the traditional limitation of teaching mode in time and space, that is the Internet+, and has brought long-term influence on the teaching of higher vocational colleges [2]. It is also the solid foundation in the development of the emergence and development of intelligent classroom teaching models [3]. By deep integrating and innovating the information technology, we can build the classroom equipped with smart devices and classroom teaching that has realized the comprehensive reform of teaching concept, content, structure, method, evaluation, teacher-student relationship, and teaching and learning relationship [4]. Taking the general course of College Chinese as an example, this paper makes a special study about the establishment and application of intelligent mode for teaching in a classroom. The connotation of a classroom equipped with smart devices and the development status of the classroom equipped with smart devices are elaborated on in upcoming sections.

1.1. Connotation of a Classroom Equipped with Smart Devices. In 2008, the concept of smart planet was first put forward by IBM, and then there was a boom in the world, such as smart city, smart transportation, smart medical treatment, smart campus, and smart education [5]. The "classroom equipped with smart devices" came into being. Classroom equipped with smart devices emphasizes the transformation from the traditional "knowledge classroom" of knowledge teaching to the new "classroom equipped with smart devices" of developing wisdom. All types of digital data and intelligent information technologies offer equipment foundation and technical support for the creation of classroom equipped with smart devices with the advent of the big data era [6]. Classroom equipped with smart devices refers to taking modern information technology as the support, aiming at improving students' comprehensive literacy and promoting students' intelligent development, seamlessly connecting online and offline, in class and extracurricular teaching resources, constantly innovating teaching and learning methods, integrating information technology means into the teaching process in classroom, and improving the efficient interaction between the members participate in the procedure of teaching, so as to sufficiently promote students' autonomous learning ability. The cultivation of inquiry ability and wisdom ability will build a three-dimensional and intelligent new classroom [7]. Classroom equipped with smart devices has the characteristics of diversified teaching decision-making, mobile teaching process, intelligent resource push, three-dimensional communication and interaction, real-time evaluation feedback, and so on.

1.2. The Development Status of the Classroom Equipped with Smart Devices. Classroom equipped with smart devices has appeared only for ten years, but the momentum of rapid development and theoretical research results are very rich and have been widely used in practice. In terms of development time, the development of classrooms equipped with smart devices has gone through three stages: the first stage is a preliminary exploration and pilot practice, namely, smart class 1.0, the second stage is integrated construction, integrated application, smart class 2.0, and the third phase is integrated innovation and intelligent development, i.e., smart class 3.0, and we are today. From the perspective of education level, there are classrooms equipped with smart devices in primary schools, classrooms equipped with smart devices in middle and higher vocational colleges, and classrooms equipped with smart devices in universities. Relatively speaking, classroom equipped with smart devices is more widely used in the field of primary and secondary school education, and the research is also more in-depth [8]. The application and research results of a classroom equipped with smart devices in higher vocational colleges are less, especially the research results of intelligent classroom teaching mode of general education courses in higher school or colleges.

From the perspective of development prospects, smart classroom has broad development space and application prospects, but the academic understanding of smart classroom is generally narrow, resulting in a large number of teaching practices cannot be in-depth and standardized, and the deep integration of information technology and classroom teaching has not been realized. College Chinese is very important for the teaching and function in cultivating Chinese expression and application ability. It also plays an important role in improving literary appreciation ability and comprehensive quality. It inherits the excellent culture of the motherland and strengthening cultural self-confidence and national self-confidence. However, the current situation of College Chinese teaching in higher vocational colleges is not optimistic [9]. There exist many problems, such as outdated ideas, inaccurate positioning, single means, and low efficiency.

First, teachers' educational concept still stays in the traditional knowledge classroom stage, advocating knowledge teaching and highlighting the goal of knowledge mastery, while ignoring the goal of ability training and emotional literacy. Teachers often presuppose teaching based on their own experience. They have no time or channels to understand students' needs, abilities, and thinking characteristics, resulting in the classroom looking "wonderful," but unable to be "accurate." Secondly, the role orientation of teachers is not accurate. The classroom is often the "one speech hall" of teachers. Teachers are the absolute authority and are the imparter and indoctrinator in the procedure of teaching. Students are only passive knowledge recipients. This kind of classroom teaching ignores the needs of students' free thinking and personal emotional expression, and it is difficult to cultivate students' innovative ability, thinking ability, and skeptical spirit. Thirdly, the traditional teaching methods are relatively single and backward [10–12]. Traditional classroom teaching mainly includes the stages of reviewing and questioning the learned knowledge, teachers explaining new knowledge, consolidating, and practicing new knowledge.

The teaching methods usually include teachers' explanation, one question, one answer, teaching aid demonstration, courseware demonstration, case analysis, a combination of teaching and practice, etc. The traditional teaching mode is carried out according to the factory and modular standards. Teachers are workers and students are regarded as "products" for mass production. The consequences are poor communication between teachers and students, low enthusiasm of students, and poor teaching effect. Finally, there are some problems in traditional teachings, such as low student participation and low learning efficiency. The relationship exists between the teachers and the student in the traditional classroom is tense and antagonistic. Teachers are only responsible for teaching and students are only responsible for learning. It is difficult to see the exchange of views, emotional interaction, and wisdom between teachers and students in the classroom. Students' classroom participation and sense of teaching acquisition are not ideal, of course, and the teaching effect is greatly reduced.

2. Establishment and Application of College Chinese Intelligent Classroom Teaching Model

An application in the context of Chines intelligent classrooms for the colleges is described. Initially, the rationale theory is provided. Afterward, the overall framework is discussed along with the detailed objectives, environment, activities, and methods of the teaching.

2.1. Theoretical Basis. The intelligent classroom teaching mode of College Chinese takes the "constructivism" educational theory as an important theoretical basis [13]. The core view of constructivism theory holds that we should place the student in the center of teaching; meanwhile, the role of the teacher, which is the instructor and the promoters, in the class should make full use of learning environment elements such as situation, cooperation, and dialogue, give full play to students' enthusiasm, initiative, and creativity, and finally achieve the purpose of making students effectively construct the meaning of the current learning content. Therefore, "constructivism" education theory advocates student-centered, advocates returning the classroom to students, allows students to study independently and spontaneously, attaches great importance to the creation of an intelligent teaching environment in teaching, and adopts interactive and cooperative learning methods.

2.2. Overall Framework. The intelligent teaching model in the classroom is based on the scientific teaching concept and deeply integrates with the education and teaching information technology, to build an intelligent learning ecology. Based on the educational theory and the properties of a classroom equipped with smart devices, combined with the teaching practice of College Chinese [14], the overall framework of a classroom equipped with smart devices is designed, as shown in Figure 1.

2.3. Teaching Objectives. College Chinese wisdom class was aimed at cultivating high-quality talents with good Chinese (Putonghua) expression, reading and application ability, literary appreciation ability, and love and inherit the excellent culture of the motherland. The process and methods of knowledge and skills, emotional attitudes, and values are refined into specific teaching links. According to the requirements of "three complete education," the curriculum ideology and politics are organically integrated into the teaching objectives to form the multidimensional objectives of classroom teaching. For example, the lesson "Shidan Pavilion·garden tour" will take understanding (Tang Xianzu and Dan Pavilion), mastering the basic content of "garden tour," and understanding the classic value of Shidan Pavilion as the knowledge objectives; master the four learning methods and relevant reading skills of Shidan Pavilion garden tour and form the ability goal of positive transfer from the mastery of ancient poetry and prose learning methods to the improvement of cognitive thinking ability; set Du Liniang's emotional development and growth process; build a correct outlook on life and values; and cherish youth and beautiful love as the emotional goal. The very important goal of teaching in the course is to help students to recognize and actively accept classic literary works, love, and inherit excellent traditional culture, and strengthen cultural self-confidence and national self-confidence.

2.4. Teaching Environment. Teaching environment is relying on modern information technologies, including big data, cloud computing, artificial intelligence, and virtual simulation. The classroom equipped with smart devices has created a comprehensive and three-dimensional intelligent teaching environment for intelligent resources and sharing, strong support of teaching platform, accurate analysis of learning records, real-time online communication and interaction, and intelligent detection of teaching effects. The smart devices include cameras, smart electronic boards, trackers, and GPS. The intelligent teaching platform integrates intelligent hardware equipment, an intelligent management system, and intelligent teaching resources to provide equipment foundation and intelligent support for the intelligent teaching environment. Smart teaching platform includes classroom equipped with smart devices platform, interactive intelligent whiteboard, various teaching APP, virtual simulation technology platform, etc.

Smart hardware devices, besides the computers and network infrastructure devices, are mainly desktop and portable computers, PAD, PPCLASS, smartphones, wearable devices, and other teacher-end and student-end smart devices. The intelligent management system mainly provides teaching resource management, classroom recording and service, online course management, homework task management, online teaching evaluation, intelligent learning space, etc. Smart teaching resources include online and offline resources. The main contents include curriculum standards, multiversion digital textbooks, audio electronic textbooks, reading resources, online course resources, MOOC, microcourses, multimedia materials, teaching plans, courseware, homework library, test question library, teaching dynamic data, etc. Classroom equipped with smart devices realizes the integration of "online and offline, integration of inside and outside in class, and integration of virtual reality."

2.5. Teaching Activities. The teaching activities of the classroom equipped with smart devices mainly include three links: self-study before class, internalization of the class, and expansion when the class is over. The main body of the activities is student-centered and teacher led. Taking College Chinese as an example, this paper discusses the construction and application of teaching activities in a classroom equipped with smart devices. The teachers conduct teaching design according to the research of learning situation and publish learning resources (microclass, courseware, reading audio, text materials, etc.) before class. The learning resources are published on the teaching platform of learning general (or cloud class, smart vocational education, open speech smart class, etc.). The instructors push learning tasks (knowledge test, exploration work, discussion topics, etc.) and questionnaires, timely track the completion of students' tasks, and communicate and discuss in real-time. Through

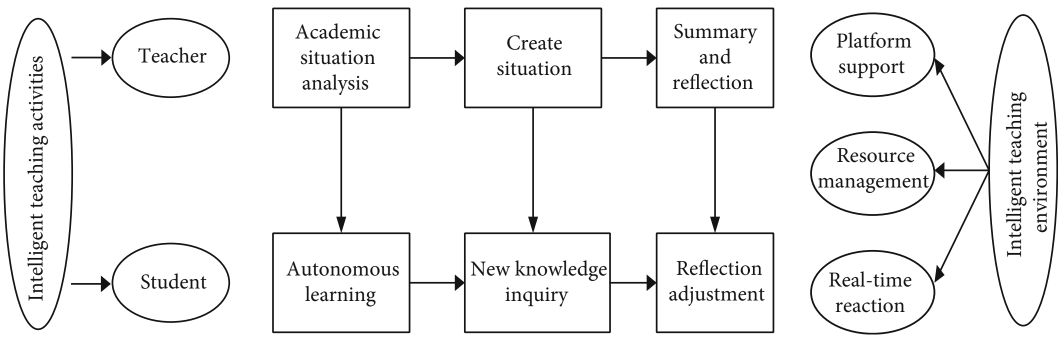

Figure 1: Overall framework of a classroom equipped with smart devices.

online and offline self-study of relevant resources, the students can control the basic knowledge and content of the text, such as the writer's life, work creation background, the basic content of the text, and key points of reading, complete the online tasks and questionnaires issued by teachers, participate in online discussions, raise questions and doubts, and realize self-regulated learning before class.

Similarly, the teacher adjusts the teaching design during the class. The teaching design is prepared according to the students' autonomous learning before class and the effect of completing tasks and creates situations by role reading, story performance, and flash animation to stimulate students' interest in learning and consolidates students' basic knowledge and skills through Q and A, summary, and reading training. Students test their learning achievements by displaying inquiry homework and completing in-class tests, and making use of the teaching platforms such as learning pass, mastering the reading skills through the model reading of teachers and students, efficiently interacting and cooperating with teachers and students to solve the important and difficult points of teaching, and complete the understanding of the ideological content of the text and the appreciation of language art and artistic conception, we integrate the curriculum ideology and politics into the classroom teaching, so that we can help the students participate in to the class can understand the classic value of excellent traditional culture very well and the contemporary value of socialist culture with Chinese characteristics in the new era, further improve cultural self-confidence and national self-confidence and realize the internalization in class.

After class, the teacher reviews and sorts out the classroom contents and summarizes, reflects, and assigns assignments and expansion tasks on the platform. Students complete the tasks on time and submit expansion assignments, such as the text Peony Pavilion garden tour. After class, students are required to read the full text and upload it to the platform, complete the knowledge test, watch the performance of Kunqu Opera Peony Pavilion, and complete a postobservation. By selecting excellent students' works, teachers can gather electronic magazines and publish them to learning, cloud class official account, microblog, and other platforms. Students can promote through reading, comments, forwarding, and other ways to achieve postschool learning expansion and ability upgrading.

2.6. Teaching Methods. The classroom equipped with smart devices takes full advantage of the flipped classroom, task-driven, situational teaching, group discussion, byod teaching method, cooperative learning, role-playing, and other methods to break the traditional indoctrination mode in the classroom and enhance the real-time communication and interaction between teachers and students, to improve student's learning enthusiasm and truly realize smart teaching and learning. The flipped classroom arranges the knowledge teaching and knowledge internalization process upside down and arranges the knowledge learning to be completed outside the classroom. The teachers or students who carry out project tasks and preparatory activities record the microclass and push it to the students through the intelligent teaching platform to complete the knowledge learning. The class mainly solves the important and difficult problems of teaching and promotes the internalization of knowledge. Teachers change from the imparter of knowledge to the instructor and promoter of learning, and students change from the passive receiver of knowledge to the active knowledge seeker of learning and become the center of the whole teaching process, to complete the reversal of the classroom.

The task-driven teaching method mainly uses the tasks set in front of the intelligent teaching platform, which can provide students with a situation to experience the actual work and think about problems, drive students to learn knowledge and explore problems with tasks, summarize the learning process and test the learning effect with the complete results of tasks, stimulate students' learning motivation, enthusiasm, and creativity, and enable students to actively establish self-study and think, ask questions, explore, practice, solve, and improve the intelligent learning system. Cooperative learning, also known as group cooperative learning, can be completed before, during, and after class. To achieve common goals, students carry out a clear division of responsibilities and mutual learning. Teachers organize smart classes, provide learning resources, help students cooperate and communicate, and promote their positive interaction, to achieve teaching objectives and improve learning results. In the role-playing method, also known as the scenario simulation method, in College Chinese classroom teaching, students play characters in stories, novels, scripts, and other texts to perform, smoothly enter the teaching situation, master the text content, and experience the characters' emotions. The role-playing method can be carried out before and during the class. Before the class, the performance video can be recorded for online display, and the live performance can be carried out in the class. Students can send barrages through the intelligent platform for real-time interaction.

3. The Cloud Computing and Its Applications

"Cloud computing" was first proposed by Eric Schmidt in a search engine strategy seminar speech on August 9, 2006, and then the term "cloud computing" began to be widely used by people or enterprises from all parties on various occasions. To put it simply, "cloud computing" means that the huge group of computers on the network is like a cloud, allowing people to use the various network services of any computer connected to the cloud to obtain the services provided by manufacturers, such as Google and Amazon, can use the huge computing resources on the server-side. Cloud computing is usually not a specific system, mechanism, or technology, but a state of computing power that provides and applies a huge amount of computing resources in the form of services through the Internet. Cloud computing has five major features: self-service, anytime and anywhere access, sharing of resources, rapid redeployment, monitoring, and measurement services. Because the cloud operations are based on sharing computing resources, on the premise of the least management work or service suppliers, through the network interaction, it quickly provides resource allocation and release, and even if resources and services increase, it will not increase too much management expenses, and usually use that pay, so make cloud computing become the focus of the information technology market.

3.1. Development Trend and Application of Cloud Computing in Education. The integration of cloud computing and the learning environment into teaching has been popularized to a considerable extent. The application of cloud computing in the field of education can infinitely extend the existing educational resources and expand educational services and benefits. Therefore, many colleges and universities are vigorously promoting relevant work. The two main aspects which reflect the usefulness of the technology of cloud computing are as follows: one is to build a lease for "sever" services; second, it is applied to the service construction part of the "cloud" for the requirements of "client." At present, the application of education cloud mainly includes online classes, such as Netease cloud classroom, Sanmeng technology, and Soke network in China, and schools such as Khan Academy in foreign countries. It mainly provides learners with massive and high-quality courses. Users can independently arrange learning progress according to their learning level. Based on the requirements of practicality, Netease cloud classroom has established cooperation with several education and training institutions. The number of courses has reached more than 4100, with a total of more than 500 class hours, including more than 10 categories, such as software application, t and Internet, foreign language learning, life and home, interests and hobbies, workplace skills, financial management, examination and certification, primary and secondary schools, and parent-child education.

Founded in 2010, Sanmeng Technology Co., Ltd. is a software and hardware manufacturer and overall solution supplier focusing on the information construction of the education industry and providing cloud computing, big data, and intelligent teaching. Since 2013, the company has focused on the information construction of educational institutions and government units and provided solutions and corresponding products and services for universities, secondary vocational schools, education bureaus, primary and secondary schools, and other types of users and provides one-stop software and hardware solutions around the service needs of cloud data center, education big data, classroom equipped with smart devices, cloud desktop, handheld mobile teaching, and cloud computing security. Mainstream universities have become the company's service customers. Through years of accumulation, the company has successfully created its own software and hardware brand of "sunm" series and gradually established its own brand barrier in the education cloud market.

The lean class network is building the Internet plus education ecosystem. It includes the university innovation and entrepreneurship credit authentication cloud platform, the party and government organ online learning assessment cloud platform, and the enterprise and institution online learning cloud platform and focuses on providing an integrated online teaching cloud platform solution for universities, party and government organs, enterprises, and institutions. Communication technology and scientific technology integrate teaching resources and realize the sharing of high-quality resources with the help of the network. Through the course network, teachers can create and edit course content online through screen recording software, tablet, and other auxiliary tools, including multimedia format courseware, exercise, reference resources, homework, and test questions. Students can preview online through the network learning, testing, discussion, and other teaching links. Thin course network can quickly build an online teaching cloud platform, including six aspects: microcourse production, online learning, mobile and fragmented learning, teaching closed loop, big data analysis and statistics, and personalized resource push, to build an online learning system that meets the needs of users. Khan College has collected more than 3500 teaching videos of Khan teachers through cloud computing to provide free high-quality education to people all over the world.

4. Research on Task Scheduling Based on ACO Algorithm

The proposed task scheduling algorithm is based on the extension of the Ant Colony Algorithm (ACO). The ACO algorithm is combined with the Hadoop open source parallel and distributed framework.

4.1. Combination of ACO Algorithm and Hadoop. In a typical Hadoop application scenario, there are only two types of nodes, one is the only master node machine, and the other is many slave nodes. This architecture setting is suitable for large tasks with a small number of concurrency and is mostly data intensive. However, for tasks with many concurrent and small granularity, if a small task is assigned to multiple slave node machines, it will increase the scheduling burden of the master and cannot make the slave node machines more focused on executing a task. Most of the cloud computing architectures based on Hadoop are ordinary PCs, which are in danger of downtime at any time, and many node machines may join or leave the platform used for cloud computing at any time, making the system scale change dynamically. ACO algorithm can be used to solve the NP problem effectively, which has strong robustness, inherently distributed parallelism, and scalability. The dynamic scalability of the ACO algorithm can well satisfy the application requirements of dynamic scalability in a cloud computing environment. The SaaS (Software as a Services) infrastructure of the cloud computing is utilized in the proposed work. The key problems that need to be addressed in the cloud computing environment based on how to reasonably schedule the massive concurrent task requests of different users with different granularity and how to reasonably allocate tasks to cluster nodes along with ensuring the load balancing include

(1) To ensure that the load rate of resource nodes is maintained in an appropriate range, such as 30%~80%. For a single computing node, the load rate of the node machine cannot be too low. If the load rate is too low and the resources cannot be fully utilized, then it should be handled. The load rate should not be too high. Too high load rate will easily affect the execution speed of the job, prolong the completion time, and reduce the user experience

(2) To ensure that the response time cannot be too long, especially for interactive application systems, too long response time will reduce the user experience. Users of highly interactive and small granularity tasks should have a shorter waiting time, and data-intensive jobs and large granularity tasks should have a longer waiting time

There is a contradiction between the above two problems. While ensuring that the load rate of resource nodes cannot be too low, we should also ensure that the job response time cannot be too long. Therefore, the task allocation problem is a NP complete problem.

Figure 2 shows the schematic diagram of task scheduling after the improved ACO algorithm is combined with Hadoop model. On the left side of the figure are n users. Users submit tasks to master node machines by wireless or wired means, including user agent (task agent), task distributor, task collector, ACO algorithm pheromone global update module, monitor, and other modules. The task distributor assigns different tasks to multiple slave node machines. With the execution and allocation of tasks, the pheromone of a single node machine will also change. The monitor module captures the performance data in real time, so that the ACO algorithm of the master can adjust during task allocation and optimization. The ACO algorithm can be used to solve the NP problem effectively, which has strong robustness and scalability. Hadoop provides distributed storage and parallel processing. Thus, the ACO is integrated with Hadoop to achieve the parallel processing and distributed storage characteristics for the ACO.

A typical task assignment problem can be described as follows: there are n tasks to be assigned to n nodes, each node can only handle one task, and the cost of different allocation schemes is different. The task allocation problem is to find an allocation scheme that enables the smooth allocation of tasks (feasibility), the minimum loss rate of tasks (reliability), and the shortest total execution time (optimality). Under the condition of the same processor performance, the complexity of the task determines the length of processor time. Complex tasks require longer processor time, while simple tasks require shorter processor time. For example, users' FTP, mail, HTTP, and other requests require different processor time due to different task request complexity and data transmission volume. The solution of the problem is transformed into how to allocate to minimize the cost of completing all tasks, that is, the task allocation problem is to solve the task allocation matrix $R_{n\times n}$.

There are n ants. One trip of ants is used to represent the assignment process of a task. In one trip of ants, ants need to take n steps. Each step represents the assignment of a task, and the steps taken by ants are recorded as s. When all ants complete a trip, it is regarded as an algorithm cycle; N_c represents the number of algorithm cycles. At the same time, the set $Task = \{task_1, \cdots, task_n\}$ and $Node = \{node_1, \cdots, node_n\}$ are introduced. The $Task$ set represents the task to be assigned, and the $Node$ set represents the processor node to be assigned.

An n-dimensional vector D_n^{Nc} and element $D_k^{Nc} \in D_n^{Nc}$ are introduced to represent the cost vector obtained by the task allocation of the kth ant in the cth algorithm cycle, and the initial value is 0 vector.

Definition 1. Cost matrix $C_{n\times n} = \{C_{i\times j} | C_{i\times j} \in C_{n\times n}\,; C_{i\times j} \geq 0\,; i = 1, \cdots, n\,; j = 1, \cdots, n\}$, which represents the cost of node i processing task J.

Definition 2. Pheromone matrix $T_{n\times n} = \{T_{ij} | T_{ij} \in T_{n\times n}, i = 1, \cdots, n\,; j = 1, \cdots, n\}$, which represents the pheromone value of task j assigned to node i. the initial value can be constant or dynamically changed. This paper analyzes and explains how to dynamically improve the algorithm in the algorithm improvement in the next section.

Definition 3. Efficiency matrix $V_{n\times n} = \{V_{ij} \in V_{n\times n}, i = 1, \cdots, n\,; j = 1, \cdots, n\}$, which represents the efficiency value of assigning task j to node i, and its initial value is $1/C_{n\times n}$.

Definition 4. Probability matrix $P_{n\times n}^k = \{P_{ij}^k \in P_{n\times n}^k\}$ is defined to represent the probability of assigning the jth task to the ith node in the kth ant task assignment process. P_{ij}^k

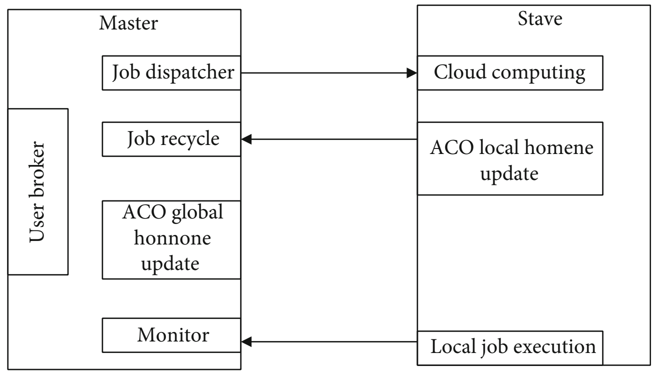

Figure 2: ACO-based task scheduling model.

can be calculated from the following formula:

$$P_{ij}^k = \begin{cases} \dfrac{T_{ij}^\alpha * V_{ij}^\beta}{\sum_{j=1}^n T_{ij}^\alpha * V_{ij}^\beta}, \text{if } j \in \omega_k \\ 0, otherwise \end{cases}. \tag{1}$$

P_{ij}^k is related to the information hormone that the ant assigned the jth task to the ith node and the efficiency of the ith node in processing the jth task. This is also the conclusion drawn from the actual ant movement process, which is in line with the principle of "more people are the way." Among them, α and β, respectively, reflect the relative importance of pheromones accumulated by ants in the process of movement and heuristic pheromones in selecting paths.

Definition 5. Task assignment matrix $R_{n\times n}^k = \{R_{ij}^k | R_{ij}^k \in R_{n\times n}^k, i = 1, \cdots, n ; j = 1, \cdots, n ; k = 1, \cdots, n\}$. Then, the task assignment problem is to solve the task assignment matrix R, and the constraint condition is

$$\begin{aligned} \sum_{i=1}^n R_{ij} = 1, i = 1, 2, \cdots, n, \\ \sum_{j=1}^n R_{ij} = 1, j = 1, 2, \cdots, n. \end{aligned} \tag{2}$$

Definition 6. The arrival time of task i is recorded as $at(i)$, and the completion time is recorded as $et(i)$. Each task has a priority attribute. The priority of task i at time t is recorded as $priority(i, t)$, and its value is a natural number.

Definition 7. Suppose that M tasks arrive in a given time, and n tasks (respectively, recorded as $1, 2, \cdots, n$) are submitted at the end of the M tasks. K tasks are rolled back due to timeout. The QoS indicators of the tasks are defined as follows:

(1) Average execution time of task ACT (average complete time)

$$ACT = \frac{\{\sum_{i=1}^n (\mathrm{et}(i) - at(i))\}}{N} \tag{3}$$

(2) Weighted average complete time WACT (weight average complete time)

$$WACT = \frac{\{\sum_{i=1}^n (et(i) - at(i)) * priority(i, et(i))\}}{\sum_{i=1}^n priority(i, et(i))} \tag{4}$$

(3) Closing rate

$$ls = \left(\frac{K}{M}\right) * 100\% \tag{5}$$

(4) Average load rate of CPU since the load rate of CPU changes dynamically during task execution, this parameter is set to investigate the load of different algorithms in large task execution with different granularity

4.2. Algorithm Improvement. The conventional ACO algorithm releases a constant Q of pheromone each time when performing pheromone local updates. If the larger the pheromone weight of the directed arc segment (x, y), the more the number of ants passing through the arc, and the more local pheromone updates, which will eventually result in the large information gap between the arcs, limiting the global search of the algorithm. Therefore, as the algorithm search state changes, the Q value should be constantly corrected and should not be a constant.

(1) Update of global pheromone

Definition 8. If the number of ants passing through the node X is m, and the number of ants passing through the directed arc segment (x, y) is M, then M/m is called the ant pheromone weight of the directed arc segment (x, y). The correction principle is the ant pheromone weight a on the path of the task from node x to node y, and $Q(t) = Q \times (1 - (M/m))$ when $m = 0$, $Q(t) = 0$.

Suppose the kth ant passes through the directed arc segment (x, y) in the qth iteration, and a total of R_k ants have passed through point X, of which r_k ants have selected the directed arc segment (x, y). The global update rule of the algorithm is

$$\tau_{ij}^{new} = (1-\rho) * \tau_{ij}^{old} + \Delta\tau_{ij}, \text{for } any\, i, j \text{ and } i \neq j$$
$$\Delta\tau_{ij} = \sum_{k=1}^{m} \Delta\tau_{ij}^{k} \tag{6}$$
$$\Delta\tau_{ij}^{k} = \begin{cases} Q * \left(1 - \dfrac{R_k}{\gamma_k}\right) \text{ if } ant\, k\, from\, i \text{ to } j \\ 0, otherwise \end{cases}$$

(2) Local pheromone update

In order to make the load more balanced, a volatile balance factor is added to the pheromone local update rule. The equilibrium factor is mainly used to describe the volatilization change of pheromone, not a constant

Set

$$\omega = \frac{length_{this}}{length_{\max}} \tag{7}$$

(3) Control of pheromone quantity

In order to avoid algorithm stagnation, the amount of information on each path is limited to a certain range [$\tau_{\min}, \tau_{\max}$], and the values beyond this range will be limited to $\tau_{\min}$ or $\tau_{\max}$, $\tau_{\min}$ and $\tau_{\max}$. It can avoid that the amount of information on one path is much larger or much smaller than that on other paths, resulting in all ants concentrating on the same path or far away from a path. The setting of $\tau_{\min}$ and $\tau_{\max}$ is very important because the maximum information added on the path of each iteration is $1/L(S^{gb})$, where $L(S^{gb})$ is the path length corresponding to the global optimal solution. Therefore, whenever the optimal solution is updated, $\tau_{\min}$ and $\tau_{\max}$ need to be updated at the same time, and $\tau_{\max}$ is inversely proportional to the pheromone volatilization factors ρ and $L(S^{gb})$, but directly proportional to the number of excellent ants. Dynamically update $\tau_{\min}$ and $\tau_{\max}$ with the following rules

$$\tau_{\max}(t) = \frac{1}{2(1-\rho) * L(S^{gb})} + \frac{\sigma}{L(S^{gb})}$$
$$\tau_{\min}(t) = \frac{\tau_{\max}(t)}{20} \tag{8}$$

where σ represents the number of excellent ants

4.3. Experimental Results and Analysis. The implementation is performed using 1 master node machine and 100 slave virtual machine nodes. Master nodes administer all the slave nodes. The Hadoop performs its working in the form of master-slave architecture. The ubuntu-9.10 system, VMware Workstation 7 0.1, Hadoop-0.19. l-fair_ scheduler, Hadoop--capacity-scheduler-0.19.1Jjar, and cloud-sim simulator software are used, to investigate the dynamic task scheduling of ACO algorithm in solving the concurrent requests of multi-user tasks with different granularity. The comparison algorithms include fs (fair scheduler) in Hadoop used in Facebook and CS (capacity scheduler) in Hadoop used by Yahoo J. The comparison parameters include average task completion time number of heavily loaded nodes, number of lightly loaded nodes, and task loss rate. The detail experimental steps include

(1) Firstly, ACO algorithm is used to dynamically allocate batch tasks from 100 to 1100 on cloud-sim platform. Because there are too many task nodes and resource nodes in the experiment, in order to more truly simulate the difference between task granularity and resource granularity in real applications, task objects and resource objects with different granularity are generated through grid let and grid resource classes in Loudi. The attribute values of resources include name, transmission capacity, seed, resource characteristics, and daily peak load, daily peak and valley load, etc. The resource characteristics are obtained through the resource characteristics structure, including structure, operating system, computer list, time-shared, and time zone

(2) To implement the fair scheduler scheduling policy, you must first set the mapped site XML file to enable the task scheduler to select the fair scheduler algorithm

(3) For capacity scheduler scheduling, mapped sit XML file, and the task scheduler uses the algorithm

In addition, the configuration file is capacity-scheduler XML, and the detailed configuration contents of the file are not listed. To simulate the task allocation more truly, we use the same data set for the three algorithms to construct the task list and resource list, respectively. Because the tasks in reality are not isolated and there is certain information interaction, we add the data exchange attribute to the tasks. The details are showed in Tables 1 and 2.

The experimental results are shown in Figures 3–7. Figure 3 shows the average task completion time (unit: s) when the number of tasks submitted by users ranges from

Table 1: Task parameter list.

Cloudlet ID	Length	File size	Output size	Data exchange
1	600000	5000	600	300
2	45000	4000	600	2000
…	…	…	…	…
…	…	…	…	…
500	200	300	40	60

Table 2: Resource parameter list.

Resource ID	Transfer	Seed	Peak load	Holiday load	Weekends
1	200	6	60000	30000	50000
2	60	30	6000	3000	40000
…	…	…	…	…	
…	…	…	…	…	
200	20000	30	300000	600000	4500000

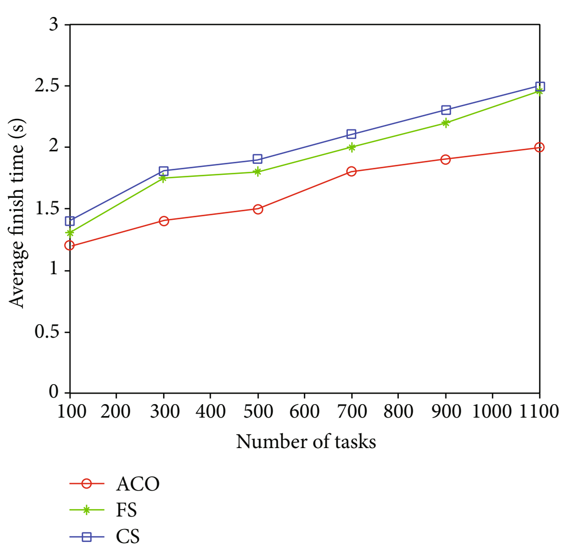

Figure 3: Average task completion time.

100 to 1100. From a macropoint of view, with the increase of the number and scale of tasks, the average task completion time shows an upward trend, which is caused by the increase of the task load to be executed when the number of resource nodes in the cloud computing system is fixed. Microscopically, the average task completion time of ACO algorithm is less than that of the other two algorithms. Because the above experimental results are obtained by using the same task resources and the same node resources on the clouds simulator, the experimental results show that the performance of ACO algorithm in batch task processing is better than the other two algorithms.

Figures 4–7 are the comparative experiments of BK and GP algorithms on R-mat and SSCA. Figures 4 and 5 are comparative experiments on R-mat data sets. From the comparison of search space (stack pressing times) in Figure 4,

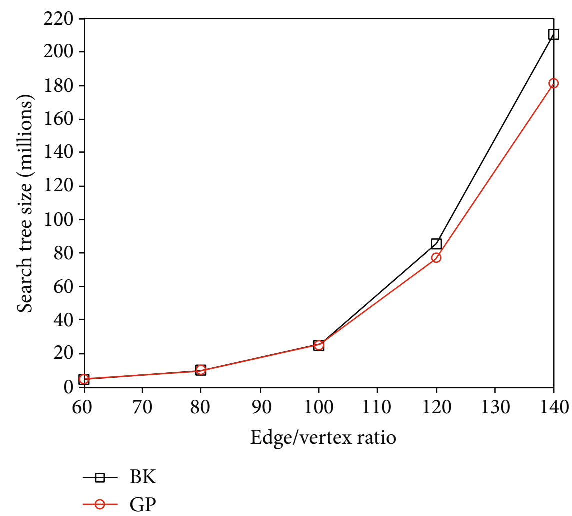

Figure 4: R-MAT: search space.

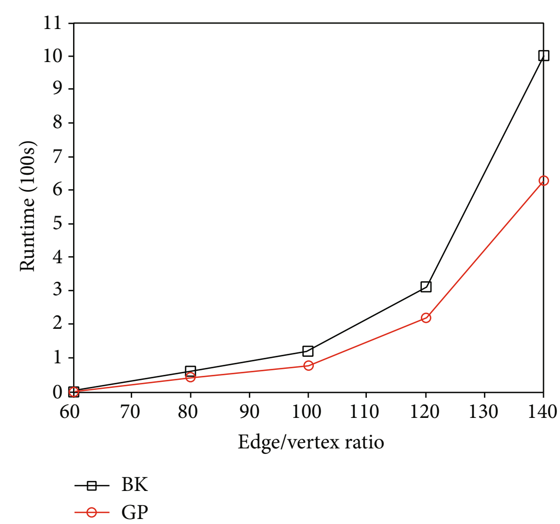

Figure 5: R-MAT: runtime.

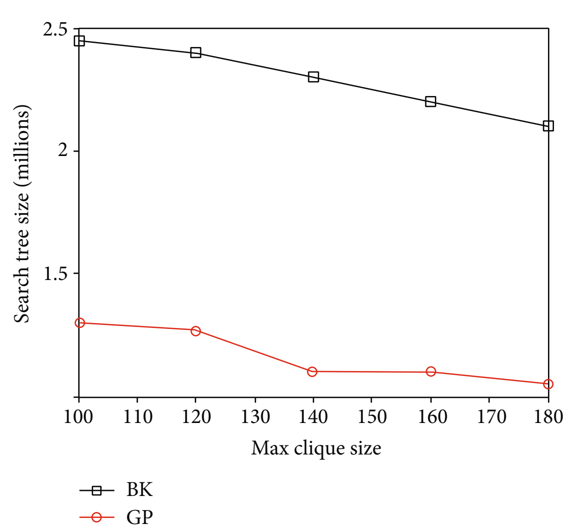

Figure 6: SSCA: search space.

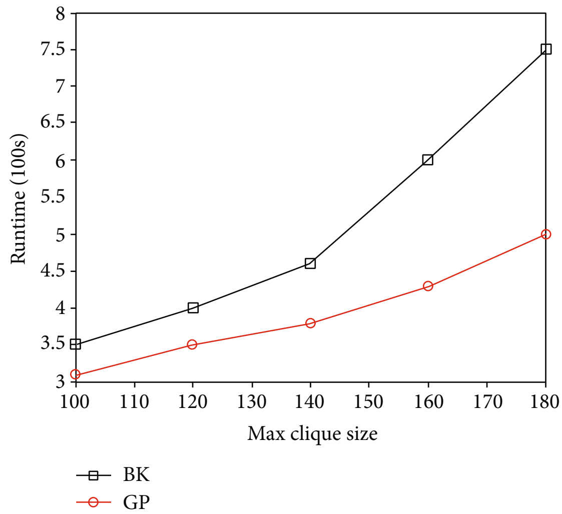

Figure 7: SSCA: runtime.

BK algorithm and GP algorithm have the same trend. With the increase of graph size, the search space of the two algorithms increases; with the increase of graph density, GP algorithm is better than BK, which can be clearly seen from the running time of Figure 5.

For the SSCA data sets in Figures 6 and 7, because the graph itself is sparse, the search space of GP algorithm is much smaller than BK algorithm, which shows that the shear efficiency of GP algorithm is significantly higher than BK algorithm on sparse graph, so that the running time of GP algorithm is significantly higher than BK algorithm.

5. Conclusion

This article proposed an efficient intelligent classroom teaching mode integrated with smart devices based on defining the concept and connotation of a classroom integrated with smart devices. The intelligent teaching mode is integrated with the present state and the expansion of smart classrooms. It also analyzes the difficulties and pain points of traditional College Chinese teaching. The purpose of this study is to create a new intelligent classroom teaching model and apply it to the teaching practice of College Chinese courses. Relying on modern information technology, a classroom equipped with smart devices has created a three-dimensional smart teaching environment with rich and diverse smart devices, coconstruction and sharing of smart resources, strong support of the teaching platform, and accurate analysis of the intelligent system. It adopts a variety of teaching methods such as flipped classroom, task-driven, cooperative learning, role-playing, and situational teaching to enhance teacher-student interaction and build a diversified, multidimensional classroom environment. A variety of comprehensive evaluation systems can realize the full coverage of intelligent teaching of independent learning before class, internalization in class, and expansion after class. It is conducive to stimulating students' learning enthusiasm, improving learning effect, and improving comprehensive quality and can provide a reference for intelligent classroom teaching in higher vocational colleges.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflict of interest.

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