

## Research Article

# Network Interactive Application of High-Performance Computing Platform for Japanese Teaching

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With the development of network technology, Japanese teaching is increasingly showing the characteristics of network, and information interaction is becoming more and more frequent. Interactive teaching is a new teaching mode under the network environment. However, traditional interactive teaching cannot meet the flexibility and dynamics of resource allocation in the network environment. In the daily Japanese teaching process, the contradiction between the students' growing need for learning resources and the unbalanced and insufficient distribution of resources is becoming more and more acute. High-performance computing is a model of swarm computing, which can solve the contradiction between complex student needs and resource allocation. Based on this, this paper proposes a Japanese interactive teaching method based on a high-performance computing platform. Experiments show that the interactive Japanese teaching method based on HPC can effectively improve students' Japanese performance. Among them, the scores of high-level students increased by 23.3%, and the proportion of middle-level students accounted for more than 70.9%.

## 1. Introduction

The emergence and development of network and multimedia technology provide a new opportunity for the innovation of the education mode. Based on this, people put forward a new teaching mode, namely, interactive teaching. The biggest feature of interactive teaching is interactivity. It conveys symbols and messages and shares feelings to students through the exchange of verbal and nonverbal information. Therefore, interactive teaching has more development potential and space than traditional teaching methods. However, in the traditional interactive Japanese teaching environment, the center of Japanese teaching is still teachers, and the main body of teaching is often only some students. As a result, in the process of Japanese teaching, the quality of teaching is only limited by the knowledge level, teaching ability, and quantity of resources of teachers, which brings huge challenges to Japanese teaching.

It has become a trend of the times to carry out teaching or auxiliary teaching with the help of network. High-performance computing can best balance student needs and

resource allocation. Therefore, the interactive teaching relying on the network and based on high-performance computing can change the teacher-centered teaching mode to a teaching mode that is dominated by teachers, dominated by students, and assisted by network interaction. This interactive teaching mode can maximize the use of resources in the entire relevant knowledge field and improve the utilization of resources. At the same time, the interactive teaching method based on high-performance computing can greatly mobilize the enthusiasm of students to learn and improve their performance. At the same time, the method can also manage the resource allocation and interaction process, so as to improve the efficiency of interaction.

The innovation of this paper is mainly manifested in two aspects. On the one hand, the article combines interactive Japanese teaching with network teaching and proposes a Japanese teaching model assisted by network interaction. On the other hand, the article integrates the high-performance computing platform with the interactive teaching mode and proposes a Japanese interactive teaching mode based on high-performance computing.

## 2. Related Work

Many scholars have put forward a lot of insights on research on interactive teaching, high-performance computing platforms, and Japanese language teaching.

Sprute et al. mainly studied the influence of intelligent environment on virtual boundary teaching, aiming to improve the perception and interaction ability of robots. To this end, they proposed a new interaction method based on a laser pointer. This method can make full use of the intelligent environment and also uses the smart home positioning method in the interaction process [1].

Yangui et al. pointed out that interactive teaching had proven its effectiveness in learning. But to study the generalizability of interactive teaching, they conducted research with first-year students in the second medical cycle. During their research, they assessed students' knowledge acquisition by comparing test scores and assessed students' satisfaction with their learning progress [2].

Tian found that the full integration of network technology into traditional teaching can maximize resource sharing. Therefore, he proposed that the establishment of distance education and network teaching platform had become the inevitable development of the times. Based on this, he proposed an embedded mobile teaching model based on network streaming media technology and introduced the technical application, system composition, and structure of the model [3].

Juangsih et al. studied the need for major language skills in Japanese textbooks in the Japanese teaching process. During the research process, they used questionnaires and interviews to collect research data and applied the Likert scale to measure the percentage of needs. Based on this, they proposed to increase the cultivation of Japanese oral skills, and this demand should be reflected in Japanese textbooks [4].

Yogyanti et al. examined the importance of Japanese learning methods and materials for tourism students. In the research process, they used the interview method and observation method as research tools to investigate the basic methods of Japanese foreigners who are engaged in tour guide business. They aimed to find out some factors that affect their Japanese acquisition and hoped to integrate these factors into Japanese teaching [5].

Winch pointed out that network performance had always been the bottleneck restricting the development of high-performance computing technology. Whether it is a computing-oriented network or a storage-oriented network, the development of communication speed lags far behind the development of the CPU. So he conducted an in-depth study of network protocols. It was aimed at improving the interconnection performance of high-performance computing, especially cluster systems; developing high-performance interconnection components that conform to standard specifications; and ultimately improving network performance [6].

Sato and Chen pointed out that foreign language teaching was both administratively and pedagogically challenging. Based on this, their research explored how a novice Japanese teacher achieved her professional development through two-

way virtual practice during her first teaching. In the research process, they used semistructured interviews and qualitative analysis to reveal the unique characteristics of foreign language teaching [7].

## 3. Network Interactive Teaching Method and High-Performance Computing Platform and Japanese Language Teaching

*3.1. Interactive Teaching Method.* Interactive teaching is a new teaching mode developed in recent years, but its earliest appearance can be traced back to 1982. In the process of continuous development, interactive teaching and the network continue to integrate and gradually get rid of the shackles of the original structured teaching [8]. In this process, interactive teaching has evolved into a teaching mode in which teachers' teaching and students' learning focus on a certain problem or topic for equal communication and autonomous interaction [9].

Interactive teaching has unique practical value. On the one hand, interactive teaching focuses on cultivating students to think independently, so that students initially have independent personalities [10]. On the other hand, interactive teaching values the mutual learning and progress between teachers and students. In short, interactive teaching can make the relationship between teachers and students harmonious and promote mutual understanding between teachers and students. In this process, teachers can help students shape a correct view of learning, rather than just being the porter of knowledge. At the same time, the correct learning concept can guide students to study efficiently and with purpose and direction. For teachers, the development of students' self-learning concept can also further supervise the improvement of teachers' comprehensive quality and achieve mutual learning in teaching. And not only teachers and students can learn from each other, but also between students and students, teachers and teachers can also learn from each other and make progress together [11]. Therefore, interactive teaching is a teaching method in which teachers' teaching and students' learning are conducted on an equal basis and autonomous interaction around a certain problem or topic on a multipoint free teaching platform under the macroteaching situation. The specific mode of interactive teaching is shown in Figure 1.

In various forms of classroom teaching, the methods of interactive education vary widely, but the purpose is the same, that is, to develop and fully mobilize the enthusiasm of students in the classroom. Among various teaching methods, the functions of interactive teaching are quite different. It can generally be summarized as follows:

- (1) It guarantees the normal operation of teaching activities [12]. The original intention of interactive teaching is to ensure normal teaching activities. So this is particularly important in all interactive teaching modes. Among them, in the interactive teaching based on network assistance, interaction plays a pivotal role

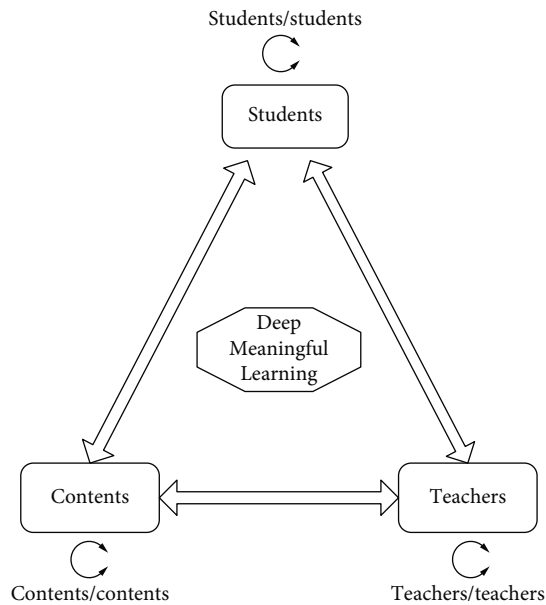


FIGURE 1: Interactive teaching mode diagram.

- (2) It focuses students' attention. In the process of general teaching practice, what teachers need to do is to preach and teach and solve doubts. But in interactive teaching, teachers often need to focus students' attention through some specific interactive behaviors, so as to improve students' acquisition of knowledge. At the same time, the interactive process can also continuously mobilize the enthusiasm of students, thereby promoting the realization of teaching goals
- (3) It grasps the student's learning situation in time. In the traditional teaching mode, if teachers want to keep abreast of students' learning at this stage, they must hold stage tests. However, in the interactive teaching, teachers can grasp the whole learning situation of the students in time through a simple interaction and adjust the teaching progress accordingly
- (4) It keeps abreast of its own learning results [13]. In the learning process, students often have absolute confidence in themselves, so teachers need to organize exams to test students' learning achievements. But for students themselves, how to keep abreast of their own learning situation is still a difficult problem. The emergence of interactive teaching allows students to have a timely judgment on their own abilities, so they can make necessary adjustments to the next learning
- (5) It strengthens teachers' teaching behavior. In classroom teaching, teachers frequently ask questions and want to hear students' answers immediately. To a certain extent, this interactive mode plays a role in strengthening the teacher's position

*3.1.1. Interactive Learning.* The continuous development of interactive teaching has led to interactive learning. The birth of interactive learning has greatly expanded the boundaries of existing teaching methods. The increasingly widespread application of electronic media has led to a greater preference for interactive learning methods of education for learners and teachers in the new century. At the same time, interactive learning has become an indispensable part of students' daily teaching. Interactive learning makes the teacher no longer the only source of knowledge acquisition. It turns the teacher into a leader in discussing and exploring knowledge with students. Interactive learning has almost completely transformed the traditional classroom. This urges teachers to change their teaching methods to adapt to today's new teaching environment. The interactive learning process conversation model is shown in Figure 2.

The conversational model of interactive learning process provides us with a preliminary blueprint for interactive learning and provides a reference for how we conduct interactive learning [14]. At the same time, the emergence of interactive learning has gradually established the basic concept of taking students as the main body and teachers as the guide. Under the guidance of this concept, interactive learning has derived many interactive modes, and the following are the most common ones:

(1) *Thematic Exploratory Interaction.* The main goal of interactive learning is to define a theme, and then, the two sides of the teaching and learning will carry out effective interaction around this theme, so as to achieve the initially set teaching goals. As the name suggests, the theme of this mode is very clear and the structure is very clear. People who use this method can conduct in-depth discussions and arouse their learning enthusiasm and creativity. The methods are generally throwing out the topic, raising the questions in the topic, thinking and discussing the problem, looking for the answer, and summarizing. However, the main disadvantage of this model is that it is very difficult to organize, and the problems encountered by users in the learning process have a certain depth, which is likely to have a negative impact on the efficiency of the teaching process [15].

(2) *Inductive Problem Interaction.* The main process of this mode is as follows: First of all, before the class, it should summarize the teaching objectives and some difficult points and sort out the problems that may be encountered in the interaction. Then, as the teaching progresses, the instructor will throw some questions to the students. The students then engage in vigorous discussions on these issues until the goal of becoming familiar with the teaching content is achieved. At the same time, it can also achieve the effect of broadening thinking. This method is also similar to the previous method. All of them can stimulate users' learning enthusiasm and creativity. However, the premise of this method is that teachers need to make sufficient preparations for the teaching content in advance.

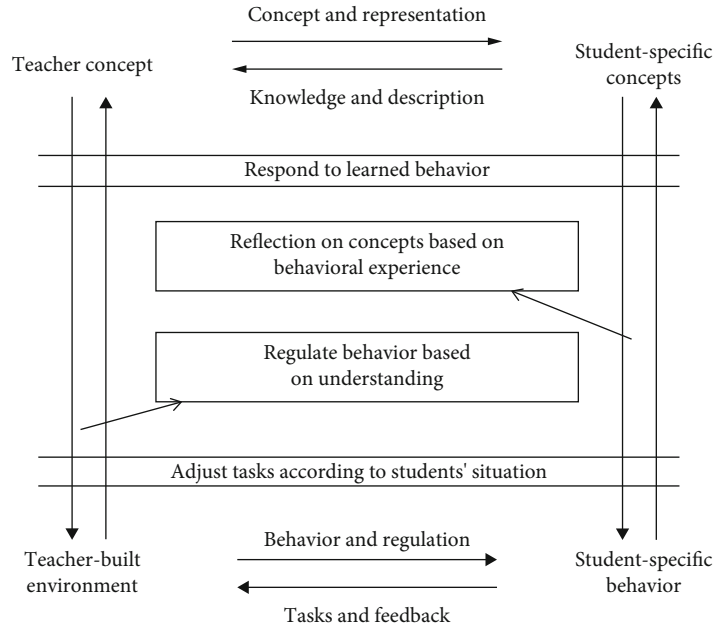


FIGURE 2: Session model of interactive learning process.

(3) *Selected Case Interaction*. This method mainly relies on multimedia tools. It presents students with carefully selected individual cases, allowing them to try to come up with a solution to the problem based on the knowledge they have in mind, and to be able to distinguish right from wrong. When explaining the case, the instructor can set up a suspense first, then make a specific analysis of the difficult points, and then let the students summarize the theoretical knowledge embodied in it. This model has the disadvantage that abstract theory cannot be studied systematically and profoundly, and it is very difficult to select a representative typical case. This leads to the consequence that the knowledge capacity of a class is far from enough [16].

(4) *Multidimensional Thinking Interaction*. This method mainly refers to the fact that students rely on existing knowledge conclusions and some empirical methods to solve problems provided by teachers. This results in finding the only optimal solution in the process of communicating and discussing with other students. This model can lead to a class with a strong atmosphere. Students can also analyze and understand problems from a more in-depth level, and the scope of discussion is relatively broad and free. But this approach is very demanding on instructors. They need to have a full understanding of the students' basic level and theoretical mastery and to be able to use the teaching mechanism to analyze and deal with some unexpected situations in the classroom.

3.1.2. *Web-Based Interactive Teaching*. The innovation of network technology has brought a new development to interactive teaching [17]. In the network environment, interactive teaching presents the characteristics of polymorphism and constantly breeds new connotations of the times. The

emergence of the Internet not only brings new technologies to interactive teaching but also brings new opportunities to interactive teaching. In this mode, the interaction between students and teachers is no longer limited to the classroom, and teaching resources are also continuously flowing from offline to online. Therefore, in this process, various resources can be continuously integrated and give interactive teaching new characteristics of the times. At the same time, the development of the Internet has also provided a new platform for interactive teaching, and the interaction between teachers and students can be seamlessly connected online and offline. Figure 3 is the interactive flow chart of network-based teaching activities.

3.2. *High-Performance Computing Platform*. High-performance computing, or HPC for short, refers to the use of aggregate computing power to handle data-intensive computing tasks that cannot be performed on standard workstations. These tasks include simulation, modeling, and rendering, among others. High-performance computing often uses different data computing models. It is commonly used in distributed computing [18]. High-performance computing has been around since its inception in 1946. Table 1 shows the development history of high-performance computing and the characteristics of each stage. When using a distributed memory configuration, different processor units cannot access the same memory space. Therefore, there must be an interconnected network before the HPC calculation can send messages or use other communication mechanisms between these units.

For decades, HPC has played an important role in academic research and industrial innovation. It helps engineers, data scientists, designers, and other researchers solve many large and complex problems more efficiently. The main

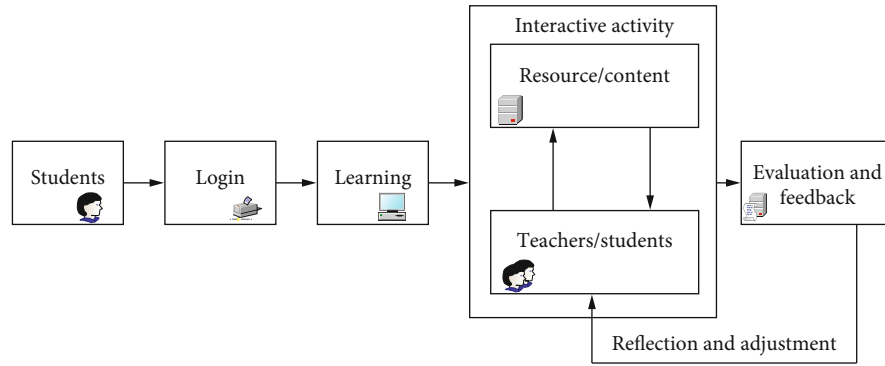


FIGURE 3: Flowchart of the interaction of network-based teaching activities.

TABLE 1: High-performance computing development history.

Time	Name	Features	Computing power
1946-1975	Vector machine	Customization	100 million times per second
1976-1990	SMP	Cost-effective	1 billion times per second
1990-2000	MPP	Shared nothing architecture	14 trillion times per second
2000-now	HPC	Cluster development	100 trillion times per second

advantages of HPC mainly include reducing the need for physical testing, etc. In addition, HPC can also be used to create simulated experiments, eliminating the need for users to perform physical testing. For example, when testing a car crash, HPC can generate crash simulations that are more economical and simpler than actual crash testing to solve real-life problems. Integrating HPC simulation into the teaching domain makes it easier to allocate teaching resources and manage student interactions. Figure 4 shows the main application areas of HPC [19].

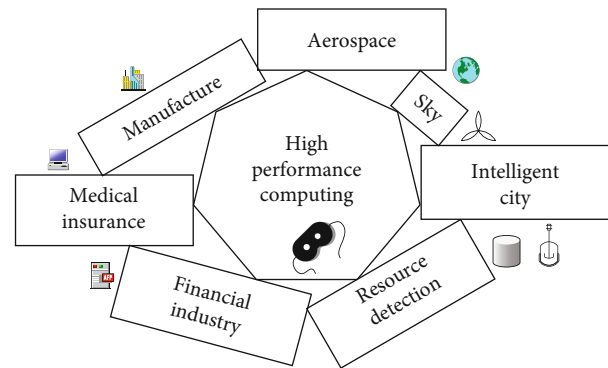


FIGURE 4: High-performance computing application areas.

**3.3. Japanese Language Teaching.** Different languages often correspond to different teaching modes. Therefore, before studying the teaching mode, we first need to study the grammatical structure of the language [20]. In today's world, grammar systems can be roughly divided into three categories. One is isolated language, one is inflectional language, and the other is stale language. The language of the isolated language is Chinese. In isolated languages, each syllable has its own independent meaning, and there is no inflection of word endings. It mainly depends on the function and function of word order in the sentence. The languages to which inflectional languages belong are English, German, and French. Inflectional language is characterized by obvious inflections. Obviously, the language to which the glue language belongs is Japanese. Its grammatical features are mainly manifested in that it relies on adhesive elements such as auxiliary words and auxiliary verbs to determine the position and function of the word in the sentence. Simply put, a fixed word may change its meaning due to different positions or different contexts. It is precisely because of the ambiguity stipulated in Japanese grammar that this determines it in actual Japanese teaching; we generally use interactive Japanese teaching.

**3.3.1. Characteristics of Japanese Language Teaching.** In the actual interactive Japanese teaching process, Japanese teaching presents a very strong hierarchy [21]. On the one hand, the interactivity of Japanese teaching will continue to change from low to high with the development of technology, and the form of interaction will continue to change from abstract to concrete. On the other hand, Japanese teaching changes with the change of the subject. In the early stage of teaching, the main body of Japanese teaching interaction is only the students above the classroom, but in the middle stage of teaching, students, teachers, and the teaching resources generated between teaching are the main body of teaching interaction. After the further development of technology, the main body of teaching has become the interaction between the traditional teaching mode and the new teaching mode. Figure 5 shows the level of interaction in Japanese language teaching.

*3.3.2. Problems and Countermeasures in Japanese Teaching.* There are still many problems in the existing Japanese teaching model. First of all, the content of the existing Japanese textbooks basically focuses on the content of grammar and more on the practice and consolidation of grammar sentence patterns and the explanation of grammar rules. Secondly, the way students learn Japanese is limited to rote memorization, there is no logic and method at all, and the results brought by the rigid memory method are often unsatisfactory. Finally, most Japanese teachers still focus on teachers in the teaching process and seriously ignore the self-development of students. And all of this makes Japanese learners less and less interested in Japanese learning.

Before the spring breeze of interactive teaching came to Japanese teaching, traditional Japanese teaching often used cramming teaching. This teaching method is particularly monotonous and boring in form, so this has led to the gradual loss of Japanese learners' interest and enthusiasm in learning Japanese. Moreover, under this teaching mode, the teaching idea of "teacher-based, student-assisted" makes learners passively accept knowledge and are forced to participate in teaching activities.

Interactive teaching is a good medicine to solve the problems of traditional Japanese teaching. Interactive teaching uses the new "teacher-assisted, student-centered" idea to replace the "teacher-centered, student-assisted" cramming-style teaching. This kind of teaching mode can realize the transformation from the teacher's unilateral initiative to the teacher-student interactive form. The following are specific interactive teaching methods. Moreover, when the learners are not very interested in learning Japanese grammar, teachers can also set up interesting Japanese learning interactive links, so that Japanese learners can participate more actively in Japanese classroom teaching.

(1) *Act in Kind.* Teachers can use some concrete objects to teach, which will make Japanese learners' observation and attention more concentrated. In this way, the main role of students in learning and their right to think independently will not be ignored. In the later learning process, as long as students see real objects, the correlation between objects and knowledge will emerge in the learner's memory.

(2) *Body Language Method.* Teachers can also demonstrate Japanese through simple and easy-to-follow body language, so as to improve learners' word-guessing ability under side influence. Japanese learners can also participate in the demonstration of Japanese grammar to further improve their subjective initiative.

(3) *Picture Display Method.* Japanese language teachers can use multimedia to display pictures to teach Japanese and provide Japanese learners with intuitive visual information. This improves Japanese learners' interest and enthusiasm in learning, making it easy to memorize Japanese knowledge.

(4) *Contextual Teaching Method.* Japanese teachers can use the contextual teaching method to teach Japanese. This

teaching strategy arises due to differences that exist between cultures. The cultural implication produced by the same grammar in different cultural contexts is likely to be quite different. Therefore, the necessary cultural background and contextual knowledge explanations are particularly important for Japanese language teachers when carrying out cultural dissemination and conduct.

#### 4. Japanese Interactive Teaching under the High-Performance Computing Platform

Network-based high-performance computing platforms can easily handle data-intensive computing tasks. Therefore, high-performance computing is essentially a network resource mapping from individual computing to group computing. Since most of the traditional teaching methods cannot adapt to the flexibility and dynamics of the network environment, we try to combine high-performance computing with the teaching mode. It is a brand-new attempt that high-performance computing is utilized to solve complex learning resource scheduling and student interaction management. Therefore, this paper will optimize on the basis of the previous resource allocation algorithm and apply this algorithm in the Japanese interactive teaching based on HPC.

In the interactive teaching and teaching resource allocation and management, how to schedule learning resources and how to spend the least energy to achieve resource allocation and teacher-student interaction have always been a big mountain for both. But in fact, this problem can be abstractly equivalent to how to add the minimum cost edge set to make the original graph become a Euler graph.

First, we define  $x_{ij}$  as the number of additions to the edge set  $(v_i, v_j)$ . Then, we define  $\delta(i)$  as the full set of edges associated with  $v_i$  in the original graph. Finally, we let  $T$  be the set of odd vertices, where  $T \subseteq V$ . Then, for the above problem, its mathematical model is expressed as follows:

$$\begin{aligned}
 M = \min & \left( \sum_{(v_i, v_j) \in A} c_{ij} x_{ij} \right), \\
 \sum_{(v_i, v_j) \in \delta(i)} x_{ij} &= 1 \pmod{2} \quad \text{if } v_i \in T, \\
 \sum_{(v_i, v_j) \in \delta(i)} x_{ij} &= 0 \pmod{2} \quad \text{if } v_i \in V \setminus T, \\
 x_{ij} &\in \{0, 1\} \quad ((v_i, v_j) \in A).
 \end{aligned} \tag{1}$$

Among them,  $A$  is the set of all edge sets and  $M$  is the minimum number of final additions. However, most of the traditional parity graph operations use polynomial algorithms; that is, they perform a check operation for each set to find a suitable edge set. However, when the resources are more complex and there are more students, there will inevitably be omissions in this method. Based on this, we introduce high-performance computing methods to

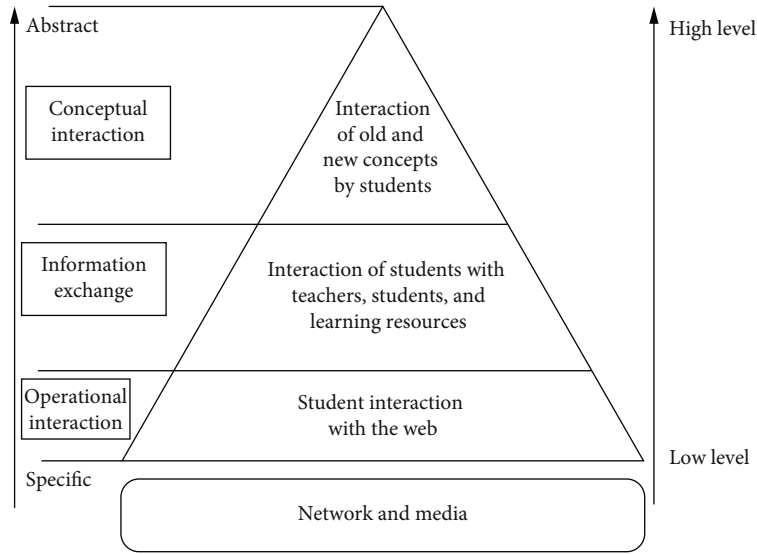


FIGURE 5: Interaction levels in Japanese teaching.

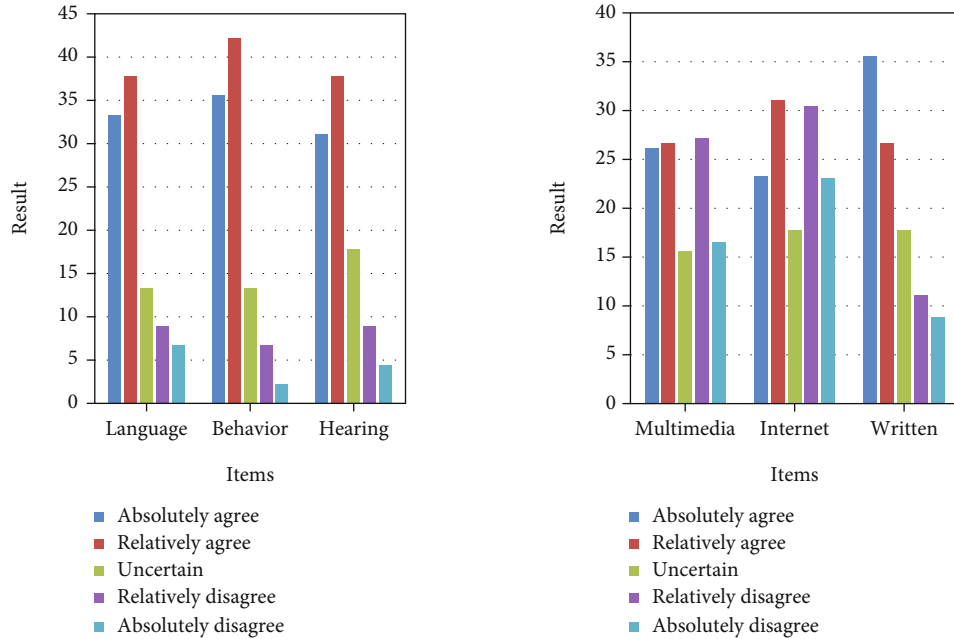


FIGURE 6: Students' acceptance of interactive teaching methods.

TABLE 2: Performance description of the experimental group and the control group.

Group	Number	Maximum	Minimum	Mean
Experimental class 1	30	84	54	64.03
Experimental class 2	31	82	41	63.91
Controlled class 1	31	84	43	64.18
Controlled class 2	30	85	53	65.11

optimize traditional polynomial computing. First we need to redefine the vertices of the original graph; then, we let  $X_{ij}$  be the number of iterations of arc  $(i, j)$ . The mathematical

model after introducing high-performance computing optimization is as follows:

$$\begin{aligned}
 M' &= \min \left( \sum_{v_i \in I} \sum_{v_j \in J} c_{ij} x_{ij} \right), \\
 \sum_{v_j \in J} x_{ij} &= s_i, \quad (v_i \in I), \\
 \sum_{v_i \in I} x_{ij} &= d_j, \quad (v_j \in J), \\
 x_{ij} &\geq 0, \quad (v_i \in I, v_j \in J).
 \end{aligned} \tag{2}$$

TABLE 3: The distribution of scores in the experimental group and the control group.

Marks	Frequency		Percentage (%)	
	Experimental class	Controlled class	Experimental class	Controlled class
Above 80	2	2	6.6	6.5
70-79	7	5	23.3	16.2
60-69	8	10	26.7	32.2
50-59	8	10	26.7	32.2
Below 50	5	4	16.7	12.9
Total	30	31	100	100

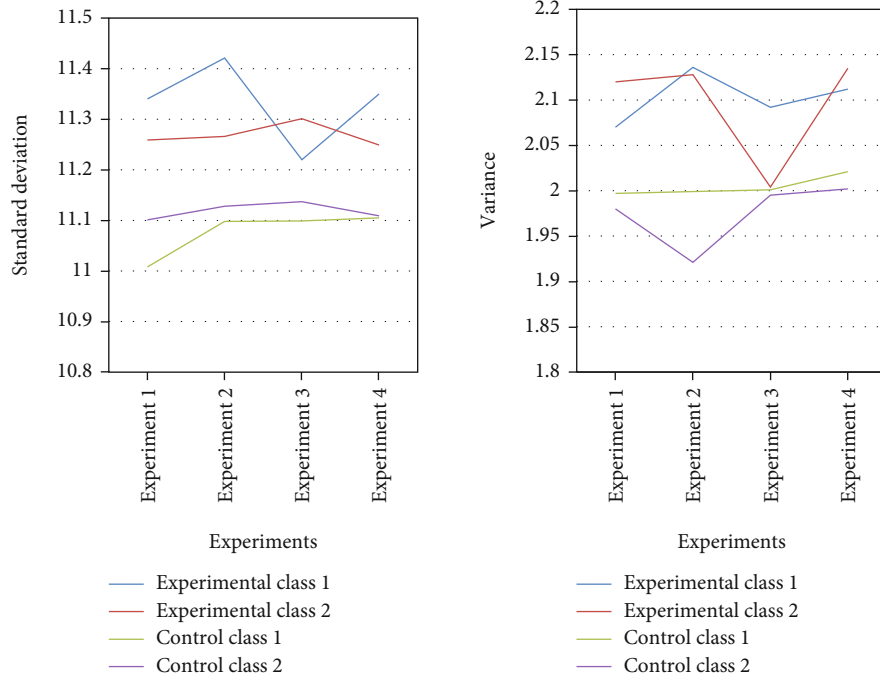


FIGURE 7: Standard deviation and variance distribution of students' Japanese scores.

$M'$  is the final number of additions,  $J$  is the set of vertices with greater out-degree than in-degree, and  $v$  is the in-degree of the edge. According to the above mathematical model, we can obtain a directed Euler graph with the smallest number of additions; that is, we can initially achieve a balance between resource scheduling and teacher-student interaction.

In the above mathematical interaction model, we assume that each resource scheduling and interaction is carried out independently, and there is no connection or prerequisite between scheduling. However, in the actual teaching process, the scheduling of resources and the interaction between teachers and students often have preconditions and are closely related.

Therefore, we define a random variable  $q$  and  $|q| \leq 1$ . It represents an arbitrary relationship between scheduling and interaction.

$$j = \arg \left( \tau_{ij} \left[ \eta_{ij} \right]^q \right), \quad q \leq q_0. \quad (3)$$

Among them,  $j$  represents the out-degree of the directed edge and  $q_0$  is a random parameter.

According to the value range of the variable, we can further get the following:

$$p_{ij}^k = \frac{\left[ \tau_{ij} \right] \left[ \eta_{ij} \right]^q}{\sum_{i \in I} \left[ \tau_{ij} \right]^{q_0} \left[ \eta_{ij} \right]^q}. \quad (4)$$

Among them,  $p$  represents the effective number of operations scheduled and  $k$  is a constant factor in this process. Through the adjustment of  $q_0$ , we can adjust the exploration degree of the algorithm to the new scheduling strategy, so as to determine the optimization direction of the algorithm.

When a new resource is added to the scheduling queue, the computing platform needs to perform a simple scheduling analysis on the computing power available in real time.

$$\eta_{ij}(t) = \sum_{i=1}^m \rho_i \text{CPU}_i(t) \cdot \text{pro}_{ij} + \frac{c}{s_j}. \quad (5)$$



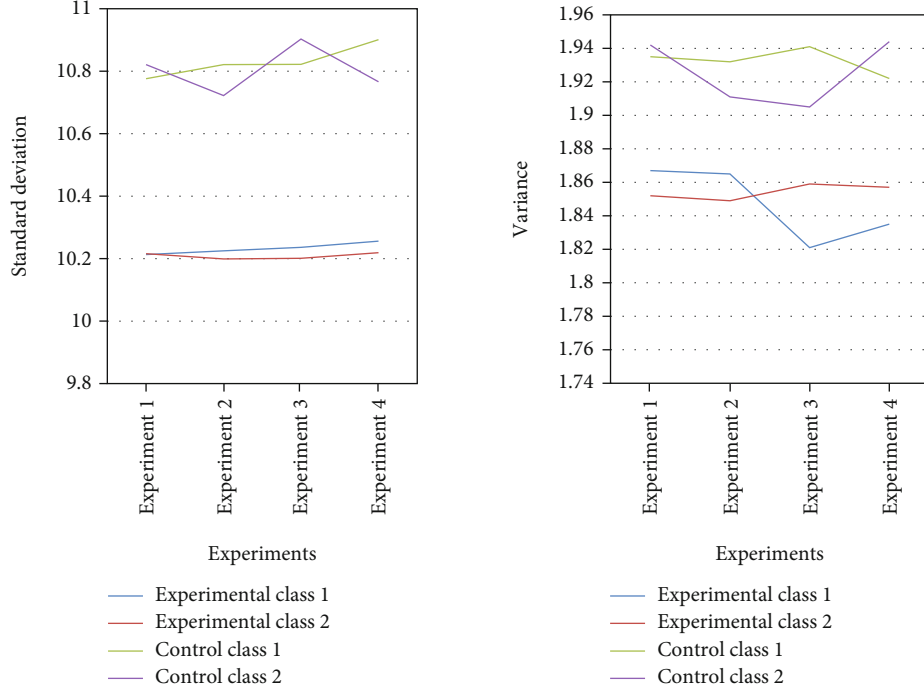


FIGURE 8: Standard deviation and variance distribution of students' Japanese scores after the experiment.

TABLE 4: Performance description of the experimental group and the control group after the experiment.

Group	Number	Maximum	Minimum	Mean
Experimental class 1	30	89	62	68.00
Experimental class 2	31	88	61	67.61
Controlled class 1	31	85	54	62.58
Controlled class 2	30	86	62	62.21

Among them,  $j$  represents the new resource,  $\rho$  represents the real-time idleness of the CPU, and  $c/s_j$  represents the ratio between the data amount of the resource and the resource transmission time. Next, after the new resource is added to the computing platform, the pheromone needs to be initialized:

$$\tau_j(t) = \eta_j(t). \quad (6)$$

After the new resources come in, the original allocation strategy must be readjusted.

$$\begin{aligned}
 L = \min f(y) &= \sum_{j=1}^m \sum_{i=1}^n d_{ij} y_{ij}, \\
 \sum_{i=1}^n r_{ij} y_{ij} &\leq a_j, \quad (j = 1, \dots, m), \\
 \sum_{j=1}^m y_{ij} &= 1, \quad (i = 1, \dots, n), \\
 y_{ij} &\in \{0, 1\}, \quad (i = 1, \dots, n)(j = 1, \dots, m).
 \end{aligned} \quad (7)$$

Among them,  $f$  represents the allocation method of resource scheduling,  $a$  represents the limited allocation times of resources  $j$ , and  $r_{ij}$  represents the effective allocation times of resources  $j$  in the resource scheduling process.

After the scheduling function starts working, the local pheromone also starts updating.

$$\begin{aligned}
 \tau_j(t) &= (1 - \rho)\tau_j(t), \\
 \tau_{s_k}(t) &= \tau_{s_k}(t) + \rho\Delta\tau_{s_k}(t).
 \end{aligned} \quad (8)$$

Among them,  $k$  represents the set of resources in the queue.  $\rho$  is a local coefficient, which only takes effect during the current operation. When all the resources to be scheduled are counted and allocated, the global pheromone starts to update.

$$\begin{aligned}
 \tau_{s_k}(t) &= (1 - \theta)\tau_{s_k}(t) + \theta\Delta\tau_{s_k}(t), \\
 \tau_{ij} &\longrightarrow (1 - \xi)\tau_{ij} + \xi\tau_0.
 \end{aligned} \quad (9)$$

Among them,  $\theta$  is the global update coefficient, which acts on the whole allocation process.  $\Delta\tau_{s_k}$  to take  $K_k$ ,  $0 < \xi < 1$ , and  $\tau_0$  is the initial value of the pheromone. After the local update and the global update, the resource calling strategy of the algorithm does not stop. Therefore, the current algorithm does not generate deadlock, and the resource allocation result is reasonable. At the same time, it also shows that the algorithm is effective in resource scheduling and teaching interaction. In the following experiments, we will further examine the practical application of the algorithm in interactive teaching.

TABLE 5: The distribution of scores in the experimental group and the control group after the experiment.

Marks	Frequency		Percentage (%)	
	Experimental class	Controlled class	Experimental class	Controlled class
Above 80	7	3	23.3	9.67
70-79	7	6	23.3	19.3
60-69	9	9	30	29.0
50-59	6	10	20	32.2
Below 50	1	3	3.4	9.8
Total	30	31	100	100

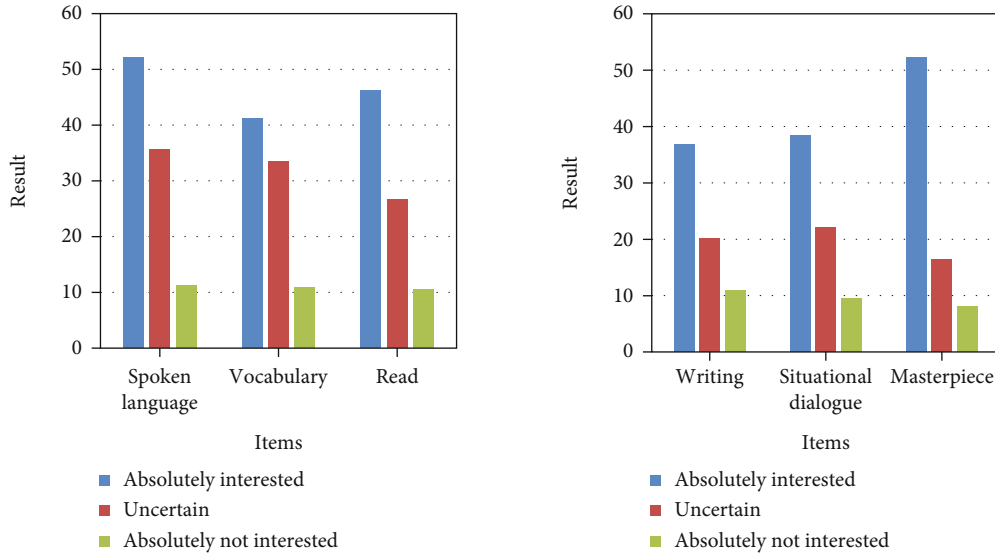


FIGURE 9: Students' comprehensive interest in Japanese.

Before the formal start of the experiment, in order to explore the students' acceptance of the interactive teaching method, we conducted a 6-dimension interactive teaching method acceptance test on 100 Japanese students. Figure 6 is the result of the test.

Figure 6 shows that most Japanese students have a positive attitude towards the interactive teaching method, and the highest support rate is 80%. But for some dimensions of interactive teaching, students also showed strong resistance. In particular, students' acceptance of multimedia and network interaction is generally not high, with negative attitudes accounting for almost 50%.

After having a certain understanding of the interaction model that students are more willing to accept, we set up two experimental classes and two control classes with 30 and 31 students, respectively. Before the interactive teaching mode was changed, we conducted a simple quiz on the Japanese proficiency of each of the four classes. The distribution of their scores is shown in Tables 2 and 3.

From Table 2, we can see that before the adjustment of the interactive teaching mode, the performance difference between the experimental group and the control group is not very large. Among them, the highest score of the experimental group was 84, and the highest score of the control

group was 85. The lowest score of the experimental group was 41, and the lowest score of the control group was 43. From the data point of view, the performance of the experimental group is slightly behind the control group at this stage. Table 3 shows that in different score segments, the overall distribution of the control group is more balanced, and the proportion of people with low scores is only 12.9%. In contrast, the low score of the experimental group accounted for as high as 16.7%, which seriously dragged down the overall level of the class.

In order to set different interactive teaching modes for different classes, we calculated the variance and standard deviation of the scores of the above four classes. Figure 7 shows the standard deviation and variance distribution of students' Japanese scores.

Figure 7 shows that the standard deviation of the experimental group is significantly larger than that of the control group. This shows that the overall grade distribution of the class fluctuates greatly, and the maximum standard deviation reaches 11.4. The standard deviation distribution of the control group basically hovered around 11, and the maximum value did not exceed 11.2. Variance can better describe the overall level of a class. The smaller the fluctuation of its numerical value, the more stable the overall grade

distribution of the class is. The larger the numerical fluctuation, the more unstable the distribution of scores. From Figure 7, we can clearly see that the overall numerical fluctuation of the control group is smaller than that of the experimental group. This shows that the distribution of their scores is also much smaller than that of the experimental group.

Based on this, we use the Japanese interactive teaching method based on the high-performance computing platform to teach the experimental group, while the control group will adopt the traditional interactive teaching method. Among them, the period of experimental teaching is two months. At that time, we will test the Japanese performance of the four classes again to explore the effectiveness of the Japanese interactive teaching method based on the high-performance computing platform.

After a two-month experiment, we recalculated the standard deviation and variance of students' Japanese scores. Its data distribution is shown in Figure 8.

Figure 8 shows that after the Japanese interactive teaching on the high-performance computing platform, the overall performance of the experimental group has been significantly improved. Its standard deviation is stable at around 10.2 with minimal fluctuations. In terms of variance, the value of the experimental group fluctuated around 1.85, but the fluctuation range did not exceed 0.1. This shows that the overall performance of the experimental group has been effectively improved.

In order to expand the advantages of the Japanese interactive teaching method of the high-performance computing platform, and to discover its shortcomings in practical application in time, we have described the performance of the experimental group and the control group in detail. Table 4 is the description of the scores of the experimental group and the control group after the experiment.

Table 4 shows that after the Japanese interactive teaching on the high-performance computing platform, the performance of the experimental group has been effectively improved. Its highest score has risen from the previous 84 to 89, and the lowest score has risen from the previous 41 to the current 61.

Table 5 shows that in the high-scoring segment, the proportion of the experimental group increased from 6.6% to 23.3%, with an effective increase of 16.7%. Moreover, the overall score distribution of the experimental group also tends to normalize, and the proportion of middle scorers exceeds 70.9%.

After two months of Japanese interactive teaching on the high-performance computing platform, not only has the students' grades been significantly improved, but also the students' comprehensive interest in Japanese has also increased. Figure 9 shows the students' comprehensive interest in Japanese.

Figure 9 shows that the Japanese interactive teaching based on the high-performance computing platform not only improves the students' interest in Japanese reading and writing but also improves the students' Japanese oral expression ability in language and situational dialogue.

Among them, nearly 5 students are more than 50% interested in Japanese spoken language and works.

## 5. Discussion

The network-based interactive teaching method based on high-performance computing can well solve the problems in traditional Japanese teaching. On the one hand, interactive teaching that relies on the Internet can make the resource interaction between teachers and students no longer limited to classroom resources in the traditional sense. In the network environment, the massive resources on the Internet can be used as a medium for teachers and students to interact. On the other hand, in the traditional Japanese teaching process, the allocation of resources is often decided by the teacher alone. This will inevitably lead to waste and unreasonable allocation of resources. The interactive teaching based on high-performance computing can solve the complex problems of teacher-student interaction management and resource allocation. All in all, under the combined effect of high-performance computing and network, interactive Japanese teaching will surely usher in a new development.

## 6. Conclusion

Starting from the interactive teaching, this paper first discusses the general concepts and characteristics of the interactive teaching and then introduces the interactive learning mode on the basis of the interactive teaching. It also elaborates on the general model of interactive learning. After having a certain understanding of interactive teaching and interactive learning, the article finally focuses on the analysis of the interactive Japanese teaching mode based on network and high-performance computing. However, due to the problem of time, the article does not conduct a detailed study on the algorithm accuracy of the interactive Japanese teaching method based on high-performance computing. In the future, the article will start with the accuracy and recall rate of the algorithm and will also compare other interactive teaching methods, aimed at further improving the universality of the method.

## Data Availability

No data were used to support this study.

## Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this article.

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