

Research on the Design of Digital Training System for Tourism Majors and Innovation of School-Enterprise Collaboration Mode

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ABSTRACT

Teaching digitalization and integration of industry and education are developing deeply in the field of education, this study designs and constructs the digital practical training system, innovates the teaching mode of school-enterprise collaboration, and applies it to the teaching practice of tourism specialty. The performance of the digital training system for tourism majors is tested by concurrency test, business success rate test and target system thing test. Design teaching experiments to verify the teaching effect of the digital practical training system and the school-enterprise collaboration model by comparing the gaps and changes between the experimental group and the control group in the competitiveness of students' employment, the utilization rate of resources, the tourism market research, the tourism marketing, the results of the digital practical training, and the development of tourism projects. The maximum number of users in concurrent testing of the digital practical training system for tourism majors is 20, the average number is 10.182, and all the operations of users are processed, achieving good test results. Before the experiment, there is basically no difference between the two groups in the six aspects of employment competitiveness, resource utilization, tourism market research, tourism marketing, digital practical training results and tourism project development. After the experiment, the two groups showed large differences. The scores of the experimental group were higher than those of the control group in all 6 dimensions, and the difference in the scores of each dimension was more than 5 points. The teaching effectiveness of the experimental group rose more than 4.9 points in all 6 dimensions. And the score difference between the pre- and post-test of the control group is not more than 0.5 points. In this paper, digital practical training system and school-enterprise collaboration model have better teaching effect.

Keywords: digital practical training system, school-enterprise collaboration, system performance, teaching effect

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1. Introduction

Nowadays, the demand for the input of talents in the tourism industry has increased, and the school has also put forward higher requirements for students majoring in tourism. Schools in order to strengthen the cultivation of students' practical skills, schools in the process of curriculum must strengthen the practical teaching, not only satisfied with the verification of the results of theoretical teaching, but also pay more attention to the development of students' comprehensive literacy, professional skills cultivation and practical training, innovation and strength of the improvement of the strength [1-2]. The practical training training is to provide students with the actual working environment, so that they can combine the theoretical knowledge learned during the school period with the actual operation, so as to deepen the understanding of the tourism industry, enhance the marketing and management capabilities, as well as other vocational skills, laying a solid foundation for the future career [3].

The development of practical training teaching for tourism majors cannot be separated from the support of tourism enterprises. At present, the tourism majors of various institutions in the process of running schools have to join forces with enterprises, the implementation of school-enterprise cooperation, with the help of enterprise resources to carry out practical teaching. Now most of the schools of tourism specialties in the process of school-enterprise cooperation in the process of practical teaching, there are two common forms, respectively, on-campus practical training and off-campus practical training [4]. However, the on-campus practical training is still a lot of paper type, the teacher through the case study to let students understand the process, but still lack of practical operation. And most of the schools are limited by funds and training venues, on-campus practical training venues are generally smaller in size, lack of detailed and real training scenes and equipment, but on-campus practical training competition training mechanism is still worthwhile to draw on [5-7]. The off-campus practical training solves these problems. Off-campus practical training is mainly the school is responsible for contacting tourism enterprises, dominate the students into the enterprise fixed-post internship, the enterprise and the school were dominated by their own staff as the students' off-campus and on-campus instructors [8-9]. On-campus instructors regularly visit students in enterprises, mainly responsible for solving the problems of students' thoughts and views on internship, and assisting in the guidance of professional skills. The off-campus instructors, i.e. the staff of the enterprises, are mainly responsible for strengthening the discipline and instructing the students' work skills during the internship [10-11]. This kind of practical teaching activity is carried out in the real enterprise environment, which is more obvious to improve students' practical skills. However, there are also many disadvantages, such as most of the tourism enterprises on the management of students is relatively loose, especially in the off-season simply give students a vacation, can not guarantee the implementation of the normal practice of teaching dictated by the implementation and implementation [12-13]. However, at present, there are some problems in school-enterprise collaboration in tourism majors, such as the cooperation mode is too single, the enterprise assistance is not high resulting in the capture of the effect of student practical training and other problems [14-15]. Therefore, it is necessary to update the cooperation mode to improve the students' practical training effect.

The article designs a digital training system to optimize the practical teaching of tourism majors, after which the system is improved by constructing the overall framework of the system and each functional module, and then the database design is carried out. Based on the principle of school-enterprise collaboration, the traditional teaching mode of tourism majors is innovated, and an all-round school-enterprise collaboration teaching mode is proposed. The digital practical training system and the school-enterprise collaboration mode are used in actual teaching, and the teaching effectiveness of the digital practical training system and the school-enterprise collaboration mode is examined by comparing the differences between the experimental group that adopts the practical

training system and the school-enterprise collaboration mode and the control group that adopts the traditional teaching method in six aspects: students' competitiveness in employment, utilization of resources, tourism market research, tourism marketing, results of digital practical training, and tourism project development.

2. Digital practical training teaching system design

System design is an important part of the development of practical training teaching management system [16]. Which focuses on determining the overall framework of the system, the detailed functions of each module and the underlying database structure. This chapter of the main introduction to the system hardware and software environment design, system module design, database design.

2.1. System hardware and software environment design

2.1.1. Hardware environment:

- 1) Servers: 2 dedicated servers (including 1 database server and 1 application server), with more than 16GB of RAM, more than 500GB of hard disk, and more than 2.2GHz of dual CPU hexa-core.
- 2) Client: more than 2GB of memory, hard disk more than 250GB, CPU dual-core 2.0GHz or more.
- 3) Network: LAN 1000Mbps.

2.1.2. Software environment. The software operating environment required for the practical training and teaching management system is:

- 1) Operating system: Windows XP\2003\2008, etc.
- 2) Server software: TOMCAT 6.0 or above.
- 3) Database: MySQL.
- 4) Development language: JAVA.
- 5) Development Tools: myeclipse, etc.
- 6) Client operating system: any operating platform.
- 7) Client browser: IE9.0 or above.

2.2. System Functional Design

2.2.1. Overall system framework. This practical training and teaching system adopts three-layer architecture: data layer, business logic layer and client layer. Using MySQL as the database system can ensure the integrity, security and stability of the data; the client layer consists of the user browser. The system logical framework is shown in Figure 1.

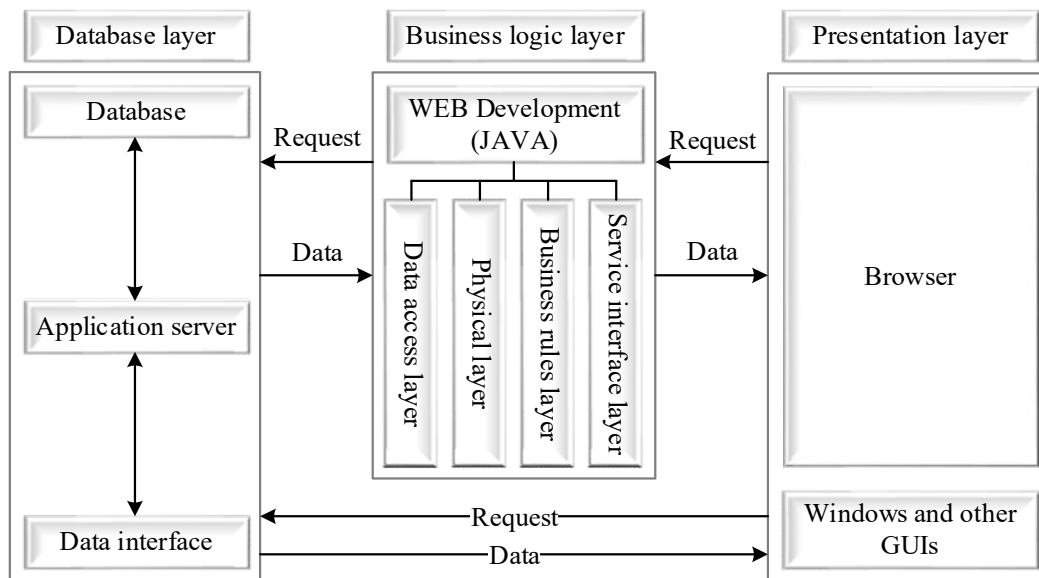


Fig 1. System logic frame

The system adopts modular structure, and each module is divided and designed strictly according to the principle of low coupling and high cohesion. Each sub-module with relatively independent functions can be developed and designed independently, modified and tested, and the main module calls each sub-module, and finally combined to form a complete system, so the system has the advantages of simplified program design, debugging and maintenance operations, and good scalability.

2.2.2. Common functional design:

- 1) Input function design. The purpose of input function design is to ensure the correctness and validity of various data inputs, mainly including the determination of data input format, the determination of input method and the determination of calibration method. For the practical training teaching management system, the correctness of the input information directly affects the correctness of the output information, although the data processing process is completely correct, but the wrong input data will certainly lead to the wrong output information. Therefore, the design of the input interface should be as simple and friendly as possible, clear and concise, in line with the general operating habits of office software. Attention should also be paid to consider adding some shortcuts to improve the input speed, such as the space bar can be used instead of the Enter key to determine the operation, you can save the mouse click to determine the operation; in the entry can be used to select the pull-down menu, and try to use the full-screen editing and human-computer dialogue features, user-friendly, simplify the operation.
- 2) Output function design. The purpose of output function design is to obtain the information output of the reported data, mainly including the design of the content and form of information output. This system mainly focuses on the output of EXCEL reports, according to the specific requirements of the management of the report format, font, length, print mode and other detailed design, and finally can be printed through the "Print" key.
- 3) System maintenance function design. The purpose of the system maintenance function design is to adapt to the needs of the school's future business development and add the appropriate maintenance functions, including the system operating environment, database and database tables, existing user names (including user roles and passwords), report formats and customization features such as the design of maintenance functions. In particular, the system needs to provide customization functions, the user can be based on changes in business needs at any time on the operating environment, database and database tables, existing user names (including user roles and passwords), report

formats, such as adding, deleting and modifying the operation, in order to improve the system's scalability and maintenance to ensure that the system adapts to the future development of the school.

2.2.3. System Functional Module Design. The key requirement of this system is put on the practicality of the system, which requires the system to be easy to operate, the browsing interface is easy to use and flexible, and it can basically complete the whole process of practical training teaching for tourism majors. According to the demand analysis and design requirements of the system, this system mainly includes: four functional modules: student practical training management, teacher practical training management, practical training teaching management and system management, and the functional modules of its system are shown in Figure 2.

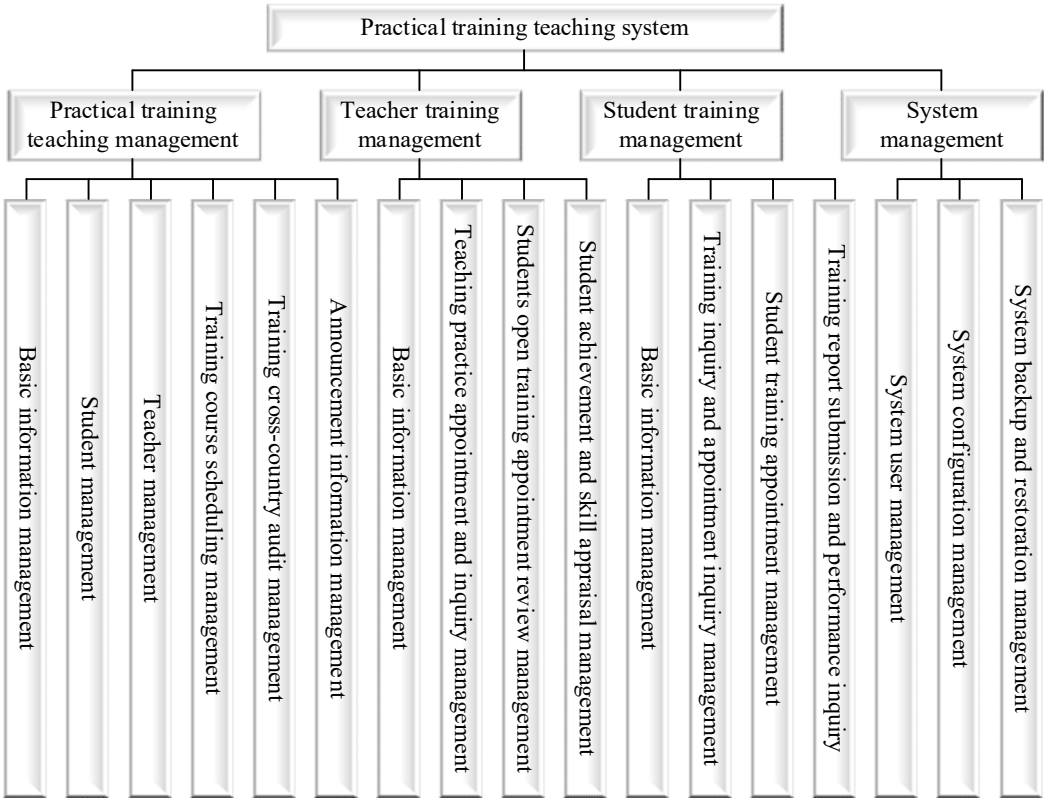


Fig. 2. Function module of system

2.3. Database design

For the teaching training system, the selection and design of its database is very important. Reasonable selection of database and design of data structure can not only meet the requirements of practical training teaching, but also reflect the latest situation of practical training teaching in a timely manner, as well as facilitating the development of the subsequent system and reduce the cost of expenditure. Through comparative analysis, we finally choose MySQL as the background database of the system, which is small in size, easy to deploy, fast and open source free.

After determining the entities of the practical training teaching system, then determine the connection between the entities. The main functions of students are to query practical training, make online practical training reservations and complete practical training reports In the practical training teaching system, students, teachers and administrators have the right to query, i.e., they have the query function, and in the case of a teacher's query for teaching practical training, for example, the teacher can query more than one practical training (1:N indicates a 1-to-many relationship). All query functions are carried out according to this model.

3. Innovative teaching model based on school-enterprise collaboration

3.1. School-Enterprise Collaboration

The purpose of school-enterprise collaboration is to adapt to the professional needs of society and the market [17-18]. In order to educate practical talents with industry-specific specialties, the school will train school or vocational education students with matching teaching contents and methods according to the requirements of enterprises.

School-enterprise collaboration is a “win-win” model. School-enterprise cooperation realizes the sharing of information and resources between schools and enterprises. Schools can provide teaching venues and make use of the relevant equipment provided by enterprises, and enterprises can also realize the organic combination of enterprise practice and students' learning in schools. It is a “win-win” model that allows schools and enterprises to realize complementary advantages in terms of venues, equipment and technology, and saves the costs of schools and enterprises.

3.2. Omni-directional School-Enterprise Collaboration Innovation Model

From the perspective of the implementation level of school-enterprise cooperation, the cultivation program is the foundation, teaching activities are the grasp, and teachers' ability is the key. Schools and enterprises can carry out extensive cooperation in the improvement of cultivation programs, teaching activities, and the construction of teachers. The model of school-enterprise cooperation in tourism specialty is shown in Figure 3.

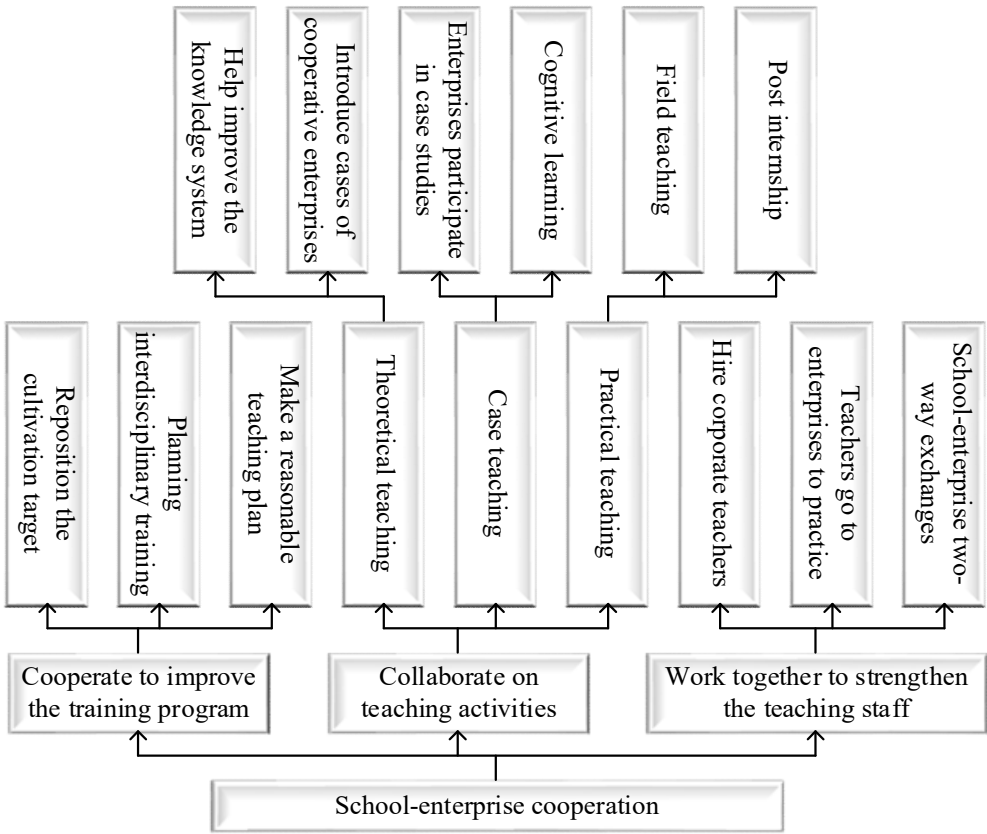


Fig. 3. Tourism major school-enterprise cooperation model

3.2.1. Collaboration to improve training programs. In the process of cultivating tourism professionals, the social demand is highly differentiated and variable, and needs to be cultivated in a

targeted manner. Enterprises in the first line of production and service, the most sensitive to the demand for tourism professionals, can accurately grasp the development of talent demand dynamics.

1) Re-positioning of training objectives. Colleges and universities should fully listen to the opinions of cooperative enterprises and reposition the training goals. Based on the cutting-edge development trend of the tourism major, the advantages of colleges and universities, and the characteristics of the industry where the cooperative enterprises are located, we should find the right balance between the cultivation of "generalists" and the "professionals" of the industry, and realize the transformation from cultivating "generalists" to "combining general and specialized" schools.

2) Reasonable formulation of teaching plan. Specific teaching plans should be formulated according to the curriculum, including the semester arrangement of each course, the arrangement of class hours, the proportion and form of practical training teaching, assessment methods, etc., so as to lay a foundation for the implementation of teaching. In this process, the school and the enterprise should work closely together to ensure that the plan is operable.

3.2.2. Collaboration in teaching and learning activities. Schools and enterprises should cooperate in all aspects of theory teaching, case teaching and practical training teaching.

1) Theory teaching. Theory teaching is mainly undertaken by the school, and enterprises can play a supporting role in the following two aspects. First, to help determine the focus of teaching. Enterprises can combine their practical experience and actual needs to assist schools in "focusing", categorizing knowledge points, distinguishing between key content, general content and optional content, so that theory teaching can be carried out closely around the needs of enterprise management. Secondly, it will help improve the knowledge system. Many enterprises, especially the backbone enterprises in the industry, have rich practical experience in coping with "Internet+" and industrial change. Colleges and universities can further summarize the new laws of tourism development under the background of "Internet+" with the help of the practice of cooperative enterprises, and incorporate them into the curriculum to continuously improve the knowledge system.

2) Case teaching. Colleges and universities should adjust and supplement the existing cases, and on this basis, one is to introduce the cases of cooperative enterprises. In the long-term management practice of cooperative enterprises, there will be many experiences worth summarizing, which can be organized and compiled into cases suitable for teaching by both schools and enterprises. These cases come directly from the enterprise practice and are real and vivid. At the same time, based on the long-term cooperative relationship, teachers and students are relatively familiar with the cooperative enterprises and their industry background, which makes them feel more immersed in the teaching and is more conducive to in-depth discussions.

3) Practical training teaching. Tourism specialties have strong practicality. For this reason, it is necessary to set up practical training courses to support teaching. Schools and enterprises work together to formulate practical training programs, increase practical training teaching hours, improve the content of practical training teaching, and give full play to the effectiveness of practical training teaching.

3.2.3. Collaboration to strengthen the teaching force:

1) Employing enterprise teachers. Professionals with certain theoretical literacy and rich practical experience in cooperative enterprises are hired as special teachers to undertake part of the theoretical teaching content with strong practicality alone or jointly with school teachers. The special teachers can combine the actual situation of the enterprise or introduce enterprise-related cases in teaching, and conduct lectures and seminars, so that students can understand and master the course content more easily.

2) Teachers going to enterprises for practice. The implementation of the practice leave system encourages teachers to go to enterprises to practice for a period of two months to one semester. If conditions are favorable, teachers can also be sent to enterprises for a longer period of time. Teachers

can enhance their practical teaching ability while serving enterprises. Teachers are supported to give full play to their professional strengths and take up the subjects of cooperative enterprises, so as to realize the organic combination of teaching, scientific research and practice.

3) Two-way exchanges between schools and enterprises. Organize exchanges between school teachers and enterprise instructors to learn from each other and complement each other's strengths, so as to improve practical ability and theoretical literacy respectively. Centralized training and special lectures for teachers are organized by cooperative enterprises, and universities can invite each other to participate in them, forming a mechanism to expand the beneficiary population and make more effective use of the resources of cooperative enterprises.

4. Empirical analysis

4.1. System performance analysis

The purpose of performance testing is mainly to verify whether the performance indicators and parameters of the system are consistent with the expectations and whether they can meet the operational requirements of the system. Performance testing includes several aspects, such as load testing, concurrency testing, throughput testing, etc. This section mainly takes the reservation experiment function module as an example to specify the performance testing process of the target system.

1) Concurrency test. Concurrency testing refers to the process of simulating the simultaneous execution of business requests by multiple users within the same time period, and observing and recording the performance indicators of the system after these concurrent execution of business requests. The concurrency test results of the tourism professional training management system are shown in Figure 4. The maximum number of users during the concurrency test of the system is 20, the average number is 10.182, the standard deviation is 5.164, and the test results are good.

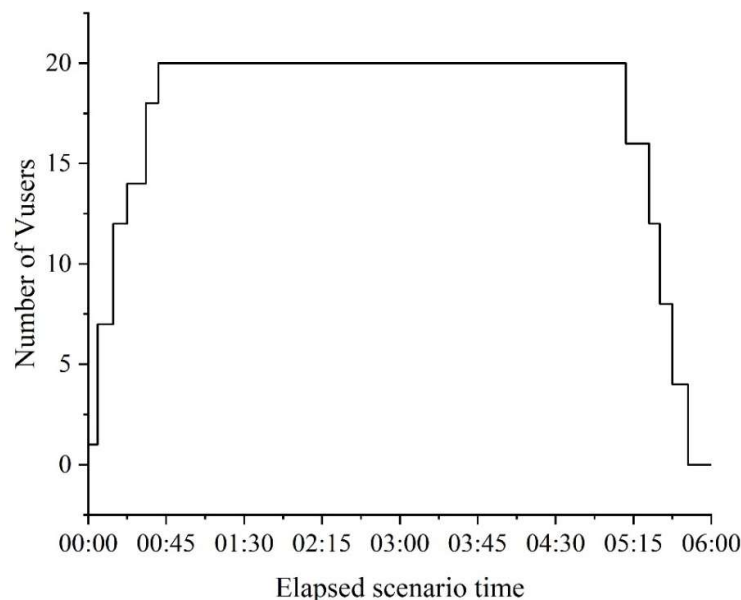


Fig. 4. Concurrent number test results

2) Business Success Rate Test. The business success rate test mainly refers to whether the system is able to smoothly execute various access and operation requests issued by the user after the user has successfully logged into the system, and the results of the business success rate test of the target system are shown in Figure 5. The traffic of "Enter Login Screen", "Exit", "Public Metrics", and "Process

Login" is 987, and the traffic of "User End Operation" and "User Online" are all 28, and all services are properly handled.

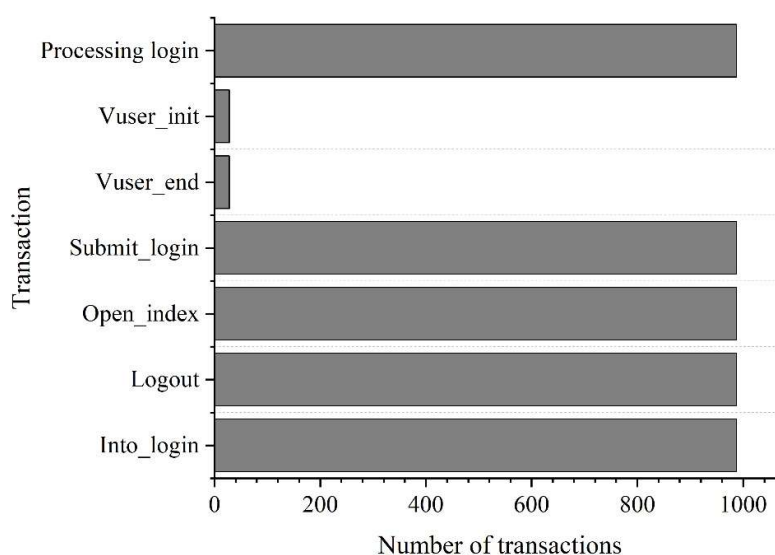


Fig. 5. Transaction success test results

3) Transactions of the target system. The transactions of the target system are shown in Table 1, which gives information about the minimum time, average time, maximum time, and whether the execution was successful or not for each operation in the system. As can be seen from Table 1, all the operations passed through the system without failures or abortions. The transaction processing performance of the target system is good.

Table 1. The transaction handling of the target system

Transaction	Min	Average	Max	SD	90%CI	Pass	Fail	Stop
Into_login	2.992	3.023	5.726	0.142	3.026	987	0	0
Logout	0.211	0.406	2.542	0.113	0.522	987	0	0
Open_index	0.074	0.203	1.227	0.077	0.307	987	0	0
Submit_login	3.136	3.315	5.345	0.153	3.425	987	0	0
Vuser_end	0	0	0	0	0	28	0	0
Vuser_init	0	0.003	0.095	0.016	0	28	0	0
Processing login	0.022	0.092	0.518	0.037	0.012	987	0	0

4.2. Analysis of Teaching Effectiveness

Two classes of students in the third year of tourism majors in Q school were selected as experimental subjects and divided into experimental group and control group. The digital practical training system of tourism major and the innovative teaching mode of school-enterprise collaboration designed in this paper are applied to the teaching of the experimental group, while the control group adopts the teaching methods that have been used all along. The teaching effect is measured in six aspects: students' competitiveness in employment, resource utilization, tourism market research, tourism marketing, digital practical training results, and tourism project development.

4.2.1. Pre-test results. Before the experiment on the experimental group and the control group of subjects of employment competitiveness, resource utilization, tourism market research, tourism marketing, digital training results, tourism project development test, the end of the test on the statistical organization of the data, the use of SPSS26.0 on the experimental data for k-s test after the

experimental data are in line with the normal distribution, and then the use of independent samples t-test to the analysis of the data obtained. The two groups of students need to be no significant difference between the experiments can be carried out. The results of the statistical analysis are shown in Table 2.

Through the independent samples t-test on the experimental test data of students in the experimental group and the control group, it can be seen from the analysis of the results in Table 2 that there is no significant difference between the experimental group and the control group in the test results of students' competitiveness in employment, utilization of resources, tourism market research, tourism marketing, digital training results, tourism project development ($p > 0.05$). Students in the experimental group and the control group are basically at the same level of development in all aspects, which meets the requirements of this experiment.

Table 2. Comparison of pre-test results of experimental and control group

Test item	M±SD		t	p
	Experimental group	Control group		
Employment competitiveness	10.12±2.87	10.04±2.57	0.448	0.379
Resource utilization	10.80±2.84	10.37±2.22	0.275	0.622
Tourism market research	9.73±4.31	9.59±4.05	0.824	0.797
Tourism marketing	9.52±3.53	9.48±3.84	0.539	0.248
Digital practical training achievement	9.87±4.31	10.02±4.03	-0.536	0.747
Tourism development	9.96±3.53	10.03±3.49	-0.338	0.831

4.2.2. Post-test results. Post-experimental tests were conducted on the students in the experimental group and the control group after the experiment to analyze the effects of the digital practical training system and school-enterprise collaborative teaching mode and the traditional teaching method on the students, and the results of the tests are shown in Table 3.

Through the independent samples t-test, it can be seen from Table 3 that after the whole experimental process, after the experiment, there is a significant difference between the test scores of students in the experimental group and the control group in terms of employment competitiveness, resource utilization, tourism market research, tourism marketing, digital practical training results, tourism project development ($p < 0.05$). The teaching effect of both experimental and control groups was improved in terms of the means, in which the means of the students in the experimental group in the six dimensions were 18.57, 15.73, 19.11, 17.42, 19.01, and 18.18, which were higher than those of the students in the control group in the test results, and the differences between the two groups were 8.19, 5.28, 9.25, 7.88, 8.79, 7.99, respectively.

Table 3. Comparison of post-test results of experimental and control group

Test item	M±SD		t	p
	Experimental group	Control group		
Employment competitiveness	18.57±6.45	10.38±3.02	6.098	0.001
Resource utilization	15.73±4.65	10.45±2.74	4.212	0.003
Tourism market research	19.11±8.33	9.86±3.64	5.323	0.001
Tourism marketing	17.42±6.14	9.54±4.05	3.768	0.002
Digital practical training achievement	19.01±7.18	10.22±3.62	6.335	0.001
Tourism development	18.18±6.94	10.19±3.88	3.736	0.002

4.2.3. Comparative results of pre-test and post-test experiments. The scores on the six dimensions of the experimental group and the control group before and after the experiment were analyzed by independent samples t-test, and the test results are shown in Table 4.

Both the experimental group and the control group improved after the experiment compared to the preexperiment, but the improvement was different. Subjects in the experimental group improved their scores on the six dimensions by 8.45, 4.93, 9.38, 7.90, 9.14, and 8.22 points, while the difference between the pre- and post-test scores of the control group did not exceed 0.5 points. And as can be seen from the p-values of the pre- and post-tests of the two groups, the teaching effectiveness of the students in the experimental group was significantly improved ($p < 0.05$), while the teaching effectiveness of the control group did not change much ($p > 0.05$).

Table 4. Comparison of pre-test and post-test results of experimental and control group

Item	Group	Pre-test	Post-test	t	p
Employment competitiveness	Experimental group	10.12±2.87	18.57±6.45	-4.185	0.002
	Control group	10.04±2.57	10.38±3.02	-0.845	0.546
Resource utilization	Experimental group	10.80±2.84	15.73±4.65	-1.545	0.005
	Control group	10.37±2.22	10.45±2.74	-0.254	0.589
Tourism market research	Experimental group	9.73±4.31	19.11±8.33	-5.745	0.001
	Control group	9.59±4.05	9.86±3.64	-0.716	0.671
Tourism marketing	Experimental group	9.52±3.53	17.42±6.14	-3.488	0.002
	Control group	9.48±3.84	9.54±4.05	-0.221	0.706
Digital practical training achievement	Experimental group	9.87±4.31	19.01±7.18	-5.846	0.001
	Control group	10.02±4.03	10.22±3.62	-0.623	0.874
Tourism development	Experimental group	9.96±3.53	18.18±6.94	-3.895	0.002
	Control group	10.03±3.49	10.19±3.88	-0.542	0.495

In summary, it can be seen that the effect of teaching tourism majors using digital training system and school-enterprise collaboration mode is far better than the traditional teaching methods used in the past.

5. Conclusion

This paper designs digital practical training system for tourism majors and innovates school-enterprise collaboration teaching mode. It is used in practice, compared with the conventional teaching mode of tourism majors, and the effectiveness of this paper's digital practical training system for tourism majors and school-enterprise collaboration mode is verified from the comparison of the teaching effect of the two modes.

The maximum number of users in the concurrent test of the digital practical training system for tourism majors is 20, the average number is 10.182, the standard deviation is 5.164, the business pass rate is 100%, all the businesses of users are processed, and the system performance is good.

Before the experiment, there was no significant difference between the experimental group and the control group in the six dimensions of employment competitiveness, resource utilization, tourism market research, tourism marketing, digital training results, and tourism project development ($P > 0.05$). After the experiment, the P-value of all dimensions of the two groups was less than 0.05, showing a large difference. The scores of the experimental group in all 6 dimensions were much higher than those of the control group, and the difference in the scores of each dimension between the two groups was more than 5 points. Compared with the pre-test, the post-test teaching effect of the experimental group increased by 8.45, 4.93, 9.38, 7.90, 9.14 and 8.22 in the six dimensions, with P-values of less than 0.05. The difference between the pre and post-test scores of the control group was no more than 0.5 points, and the P-values of all dimensions were greater than 0.05. It can be seen that the digital training system and the collaboration model of the school-enterprise have significant superiority.

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