Hindawi
Wireless Communications and Mobile Computing
Volume 2022, Article ID 7766617, 13 pages
https://doi.org/10.1155/2022/7766617

Research Article

Virtual Reality Primary School Mathematics Teaching System Based on GIS Data Fusion

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Received 3 January 2022; Revised 10 February 2022; Accepted 19 February 2022; Published 16 March 2022

Academic Editor: Shalli Rani

Virtual reality technology is becoming more and more well-known by more and more people. Informatization of education is vigorously promoted in the modernization of the country. As a new type of digital information processing platform, virtual reality technology has a huge advantage in elementary school mathematics teaching. It is based on three-dimensional spatial data for modeling, analysis, and display. In addition, as a data synthesis and processing technology, data fusion is actually the integration and application of many traditional disciplines and new technologies. Geographic information system (GIS) is a specific and very important spatial information system. This article mainly uses the method of case analysis, giving examples of virtual experimental teaching system, intelligent auxiliary teaching system, and virtual classroom teaching system to analyze the related technologies and then apply the investigation method and experimental method to test the system proposed in this article and organize students' opinions systematic attitude. Experimental data and survey results show that 78 students believe that the virtual mathematics education system is most suitable for simulating operation experience and understanding principles. And more than 50% of students believe that the virtual experimental education system has significantly increased their interest in learning. For this reason, the research on the virtual reality elementary school mathematics teaching system based on GIS data fusion is of great significance.

1. Introduction

The application of virtual reality in the education field can solve some teaching problems. Using virtual reality technology, dynamic interactive multilevel spatial analysis can be realized. The system can process the original image data according to the user's intention and generate a two-dimensional array for automatic identification. Teachers can use the GIS system to obtain the required information resources and provide real-time data support and services during the teaching process.

Mathematics teaching is a process of continuous development, which needs to be updated and improved with the times. Teachers must be able to fully understand the concepts and principles involved in the construction of virtual reality systems. Students should also be able to correctly understand virtual reality technology and improve their ability to analyze learning content and solve problems. When constructing a virtual reality teaching system, teachers should rely on teaching materials and teaching videos to ensure the sharing of information resources and facilitate compatibility between different versions.

In recent years, as the country attaches importance to education, more and more experts and scholars have begun to pay attention to the application of virtual reality technology in teaching. With the continuous advancement of science and technology and the rapid economic growth, my country's talent training model is also undergoing rapid changes. There are many theoretical results on the GIS data fusion and virtual reality primary school mathematics teaching system. For example, Wang et al. used the world's leading geographic information system (GIS) technology to establish a student information database, as well as a management and analysis system, in response to the general problem that the current university student information management methods cannot meet the local first-line teaching needs. Min said that the investigation of classroom teaching behavior is one of the important research topics.

When using the Flemish system to conduct quantitative research on high-quality courses, it is found that teachers of high-quality courses generally use self-examination for teaching [1, 2]. Liu analyzes the value of the deep integration of Changyan's multimedia interactive education system and rural elementary school mathematics teaching based on the function of Changyan's multimedia interactive education system and proposes effective strategies for rural elementary school mathematics teaching [3]. Demitriadou et al. said that elementary school students often find it difficult to understand the difference between two-dimensional and three-dimensional geometric shapes. Using virtual reality and augmented reality to visualize the possibility of 3D objects, we studied the potential of using virtual reality and augmented reality technology to teach 3D geometry courses to elementary school students [4]. Goehle provides a "virtual reality" course on common computing topics, including a description of how to implement the course in virtual reality and augmented reality hardware systems [5]. The purpose of Shin's research is to analyze the characteristics of virtual applications, which can be used to teach students who have difficulty learning mathematics [6]. Clay BS reported on classroom observations of high school mathematics teaching, focusing on the use of digital technology. The object of consideration is teachers who participate in the extracurricular course "Mathematical Structure" [7]. On the basis of these predecessors' related research, this article intends to study GIS data fusion and then analyze and design the virtual reality elementary school mathematics teaching system.

The research innovations of this article mainly include the following aspects: the first is the novelty of the research perspective. This article studies the elementary school mathematics teaching system and starts with virtual reality technology and GIS technology. The second is the innovation of research methods. This article analyzes the primary school mathematics system by studying the virtual experimental teaching system, the intelligent auxiliary teaching system, and the virtual classroom teaching system. The third is that the research conclusions are innovative. This article not only draws the benefits of virtual reality in teaching but also finds related problems.

2. Virtual Reality Primary School Mathematics Teaching System Based on GIS Data Fusion

2.1. Virtual Experimental Teaching System. Virtual experiment is a link that cannot be ignored in the teaching process of distance education. For disciplines with strong practicality, experiment is a necessary link to acquire knowledge, improve skills, and participate in practice. Therefore, it is of great significance to study the teaching effect and application of the virtual experimental system, optimize the experimental teaching in distance education, perfect the teaching theory of distance education, and give full play to the advantages of distance education. Experimental distance learning is an important part of overall distance learning, but there are differences between experimental distance learning and theoretical distance learning [8, 9].

The so-called virtual reality technology is a comprehensive technology that makes full use of powerful computer software and hardware resources and various advanced sensors. The virtual experience seems to be a simulation experience in the broadest sense, but from the perspective of the real fidelity of the experience and the universality of the application, as well as the real-time experience and experience effects of the experimenter, the traditional computer simulation experience is absolutely unparalleled [10, 11].

The role of virtual reality technology in virtual experience is as follows.

Make up for the lack of distance learning conditions. In distance education, due to testing facilities, testing facilities, and teaching aids, some educational experiments to be set up cannot be carried out. The use of the virtual reality system can overcome these shortcomings: students can have various experiences without the same experience as the real experience, enriching perceptual knowledge and deepening the understanding of course content. Avoid all kinds of dangers caused by real experience or operation. In the past, when the experiment was dangerous, TV video was often used as a substitute for the experiment. Students cannot directly participate in experiments and gain perceptual knowledge. Using virtual reality technology for virtual experience can avoid this problem. Students can enter and observe the inside of these objects [12–15].

The virtual experimental education system is a networked computer education system that uses virtual reality technology to simulate real-life experience and provide a virtual laboratory for education. As an important supplement to the existing laboratory functions, the virtual experimental education system can support classic experimental education. Therefore, in recent years, schools of all levels and types have paid attention to the development of experimental virtual education systems. With the continuous development and maturity of the virtual experimental education system, the virtual experimental education system has emerged from the ivory towers of some colleges and universities and has been popularized in various education and training institutions [16–18].

The development of the virtual experimental education system has roughly gone through three stages: virtual demonstration experience, interactive virtual experience, and distributed virtual experience. Although the implementation methods and technical support of the three are different, the basic ideas are the same. Both use different system mathematical models, physical models, virtual reality models, and mathematical effects models to study relatively complex or abstract real systems.

2.2. Data Fusion and GIS Technology. Data fusion refers to the analysis and integration of information obtained in actual teaching through different methods and technical means to achieve the expected purpose, improve work efficiency, and enhance learning benefits. Data fusion is based on a large number of mathematical operations, combining reality with virtual reality, and analyzing these real worlds to obtain the required information [19, 20]. When building a virtual reality system, data needs to be analyzed. First, build a three-dimensional space model. Through the processing function of GIS software, the model is transformed into a two-dimensional rectangular coordinate system and four-dimensional coordinate information is expressed. Then, the relationship between all elements in the three-dimensional scene is determined according to the attributes of the generated graphic objects and the features contained in the corresponding database. In the virtual reality system, establish the corresponding data dictionary. Finally, the three-dimensional space is divided into different regions by dividing it. It is very necessary to use GIS data fusion software to establish a virtual reality database. When constructing this database, the relevant parameters of various places need to be managed uniformly. At the same time, it is also necessary to formulate operating standards that comply with local usage habits and have scalability requirements based on actual conditions. First, various graphics and words are processed and sorted, and then different types and different types of information are combined to form a complete, independent, and perfect, easy to call, easy to maintain, and easy to query and retrieve [21, 22].

People are aware of the convenience brought by data fusion technology to decision makers, enabling people to obtain more accurate and effective data. As far as my country's current research on data fusion is concerned, it is specifically focused on two aspects: web document data fusion and data fusion of related data. Data fusion is mostly aimed at similar information, and modeling and fusion of heterogeneous information cannot provide a more complete solution [23, 24].

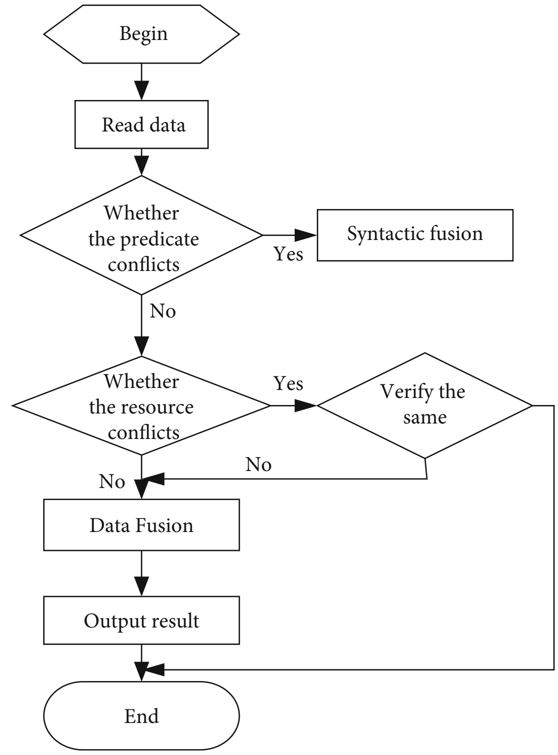

Figure 1: Data fusion process.

2.2.1. The Functional Model of Data Fusion. From the perspective of the functional model of information fusion, the functional model has the following functions: sensor registration monitoring area, each time the registered objects are collected for measurement and evaluation, and various measurement parameters (parameter d'object and state) transmission. The function of data calibration is to unify the time and space reference points of each sensor. Related processing is used to process new reports collected from a specific sensor and report data from other sensors. State estimation includes merging a new data set with the original data each time and estimating the parameters of the monitored object according to the observation value of the sensor [25, 26].

2.2.2. The Process of Data Fusion. According to the process shown in Figure 1, the fusion operation is carried out step by step. In the fusion process, it is necessary to verify predicate conflicts and attribute value conflicts. When the resolution method is adopted in the realization process, the conflict of the predicate is resolved by syntactic fusion. When attribute values conflict, verify the accuracy of the resource. If there is no identity, continue to perform the fusion operation, otherwise, end this execution.

2.2.3. Technical Methods of Data Fusion. Assuming that the action function of the BP neural network is a sigmoid nonlinear function, the output n_k^l of the hidden layer node l:

$$n_k^l = g\left(\sum_{i=1}^{x} \varpi_{ik}\mu_k^l - \alpha_k\right), k = 1, 2, \Lambda, q. \quad (1)$$

Among them, ϖ_{ik} is the connection weight from the input layer to the hidden layer, and α_k is the threshold of the hidden layer. The output d_k^l of the corresponding output layer node s is

$$d_k^l = g\left(\sum_{k=1}^{q} w_{ks} n_k^l - \kappa_s\right), s = 1, 2, \Lambda, p. \quad (2)$$

Among them, w_{ks} is the connection weight from the hidden layer to the output layer, and κ_s is the threshold of the output layer. According to the actual output d_k^l and the desired output mode, calculate the generalized error d_k^l of each unit of the output layer:

$$e_k^l = \left(\kappa_s^l - d_s^l\right), s = 1, 2, \Lambda, q. \quad (3)$$

The goal of network learning is to minimize the error function F_1, which is defined as follows:

$$F_1 = \sum_{s=1}^{p} \frac{\left(z_s^l\right)^2}{2}. \quad (4)$$

Use the method of gradient descent to find the adjustment amount of, w_{ks}, κ_s, ϖ_{ik}, and α_k.

GIS is based on geographic information system, which records and expresses spatial information through graphics and text. GIS is a type of geographic information system, which uses graphics, text, and other technologies to represent complex data as an organic combination of graphics and sound. Its purpose is to satisfy user needs by analyzing and processing spatial information. In the digital society, GPS can be used to realize the automatic map conversion function. Use the 3D reconstruction method to build the model. The use of coordinate transformation principles to construct virtual reality mathematical models, etc. is all application models based on GIS software. It is a set of dynamic graphics systems developed based on geographic information systems, which has high practical value and a wide range of applications. GIS is the use of graphics, images, text, and other technologies to collect all kinds of information in geographic space and then use the computer as the basis after sorting it out. It has powerful data storage functions and analysis capabilities. Through GIS technology, graphics, text, and other information can be effectively processed to form geospatial data with certain laws and characteristics. It contains a large number of rich and diverse related to human production and life and can be widely used in various fields.

2.3. Intelligent Auxiliary Teaching System Based on Data Mining. According to the learner's personalized information feature vectors r, r_1 (student number), it can be known that the feature vectors of different learners constitute their personalized information feature matrix. Web usage mining is one of the key technologies for the overall analysis of learning resources. The similarity matrix $\lambda_{a\times 30}$ between a certain learner and learners with similar characteristics is as follows:

$$RS_{a\times 30} = \begin{Bmatrix} r_{1.1} & r_{1.2} & \Lambda & r_{1.30} \\ r_{2.1} & r_{2.2} & \Lambda & r_{2.30} \\ \Lambda & \Lambda & \Lambda & \Lambda \\ r_{a.1} & r_{a.2} & \Lambda & r_{a.30} \end{Bmatrix}, \tag{5}$$

$$\lambda_{a\times 30} = R \times RS_a = \begin{Bmatrix} \lambda_{1.1} & \lambda_{1.2} & \Lambda & \lambda_{1.30} \\ \lambda_{2.1} & \lambda_{2.2} & \Lambda & \lambda_{2.30} \\ \Lambda & \Lambda & \Lambda & \Lambda \\ \lambda_{a.1} & \lambda_{a.2} & \Lambda & \lambda_{a.30} \end{Bmatrix}. \tag{6}$$

Using the Euclidean distance formula in the fuzzy concept, we get

$$D_2(m, n) = \left(\sum_{i=1}^{a} |m_i - n_i| \right)^{1/2}. \tag{7}$$

Among them, $m = (m_1, m_2, \Lambda, m_i)$, $n = (n_1, n_2, \Lambda, n_i) \in R$. Then the Euclidean distance of feature encoding:

$$D(m, n) = \sum_{l=1}^{a} |\lambda_m(l_l) - \lambda_n(m_l)|. \tag{8}$$

When $D(m, n)$ is small, it means that the characteristics of the learner and another learner are very similar. The calculation method using the characteristic prc is as follows:

$$\mathrm{pr_c} = \{ \langle q, \mathrm{weight}(q, \mathrm{prc}) \rangle | q \in q, \mathrm{weight}(q, \mathrm{prc})| \geq \lambda \}. \tag{9}$$

Among them,

$$\mathrm{weight}(q, \mathrm{prc}) = \left[\frac{1}{|c|} \right] * \sum_{r \in P} W(q, r). \tag{10}$$

Assuming that the current session of the user can be expressed as $P = \{p_1, p_2, \Lambda, p_a\}$, and the overall usage characteristic D can be expressed as $D = \{W_{1d}, W_{2d}, \Lambda, W_{ad}\}$.

$$\mathrm{Match}(p, d) = \frac{\left[\sum_l \left(W_l^d * p_l \right) \right]}{\left\{ \left[\sum (p_l)^2 * \sum_l \left(W_l^d \right)^2 \right]^{1/2} \right\}}. \tag{11}$$

The recommendation coefficient of using web structure crawler technology to judge whether a website is recommended to learners can be expressed as

$$\mathrm{Recommend}(q, p) = [\mathrm{weight}(q, d) * \mathrm{match}(p, d)]^{1/2}. \tag{12}$$

With the rapid development of the Internet and computer technology, various WEB-based auxiliary education systems are increasingly used in colleges and universities at all levels. The auxiliary education system can be used for online learning, online testing, online tutoring, teaching aids, tutoring materials, and communication and interaction between teachers and students, and between students.

The system is mainly composed of two parts, an offline processing module and an online processing module, as shown in Figure 2.

The online processing module of the personalization system will recommend the hyperlink that the user will visit based on the user's profile and the page currently being browsed. The user can follow the recommendation or click on other hyperlinks. The system interface transmits the user's current access operation to the web log usage pattern mining module, which can obtain the current user access operation to obtain the results of web log usage pattern mining and recommend resources for users.

2.4. Design of Intelligent Teaching System Development Architecture. In the EGL language development environment EDT, various development wizards are provided to automatically generate different components of the EGL language. From the creation of the EGL project to the development and debugging of the EGL project, it runs through the entire development cycle of the EGL project. In the project creation cycle, EDT provides a wealth of project templates

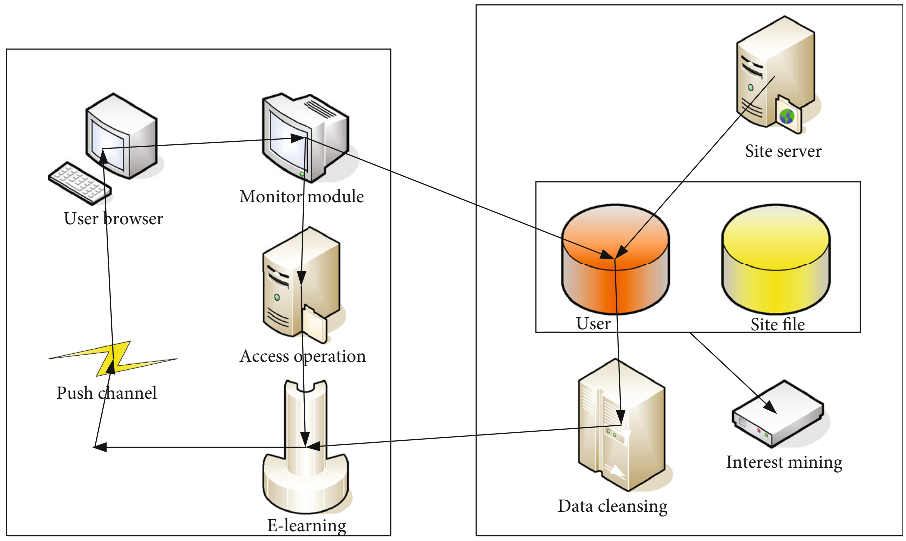

Figure 2: Personalized model architecture.

for the EGL language to provide developers with services for different purposes. If needed, users can customize template types to provide new template support for new projects in the form of plug-ins.

Intelligent teaching system is an important development direction for computer-assisted teaching. It means that developers use artificial intelligence technology to make computers play the role of educators in personalized teaching and implement personalized teaching models for learners. Different learning strategies are adopted for learners with different learning characteristics and different learning abilities, and the learners' future learning directions are adaptively taught to achieve the purpose of truly individualized teaching. The logical structure of the intelligent teaching system is generally divided into a three-module structure and a four-module structure. However, with the development of science and technology and the emergence of new technologies, the logical structure of the intelligent teaching system has also undergone corresponding changes. This intelligent teaching system is mainly provided by application servers, database servers, and Web servers, etc., and teachers, administrators, and students can access the system through the Internet. Generally speaking, the basic logical structure of the intelligent teaching system is roughly composed of three basic modules: student module, teacher module, and knowledge base.

The intelligent teaching system is mainly composed of three parts: web server, application server, and database server. The system can be accessed through the Internet. However, these three parts are divided below, as shown in Figure 3.

The intelligent education system is an adaptive education system supported by artificial intelligence: replace the role of the teacher with a computer, implement personalized teaching, transfer knowledge to learners with different characteristics and needs, and let learners guide them. With the help of the Internet, students and teachers can learn and teach through the Internet's intelligent e-learning and e-consulting systems. On the intelligent teaching system platform, teachers can guide students according to their learning situation, update the knowledge base according to various information of students, and formulate test questions that are more suitable for students to learn independently. Through the personalized on-demand function of the system, the intelligent teaching system can provide learners with educational resources that are more in line with the needs of learners and help learners improve their learning efficiency.

A complete computer adaptive test needs to involve many links of work, including parameter estimation (mainly refers to the estimation of the testee's ability and project parameter), question bank construction, question selection, and determination of test termination conditions. The computer adaptive testing process can be roughly divided into two stages: the first stage is the preliminary estimation stage, which is mainly used to roughly estimate the level of the subject at the beginning of the test. The second stage is the precise estimation stage, which is mainly based on the initial value of the ability estimation in the first stage, using the maximum likelihood method or other estimation methods to estimate the ability value of the subjects in the process of answering questions.

2.4.1. Item Response Theory. The parameter estimation in item response theory is a very important process, and it is also a very difficult process. Based on the partial independence hypothesis of item response theory, the results of each subject do not affect each other when answering different items, and the results of different subjects answering the same item are also independent of each other.

When only one subject participates in the test consisting of A items, $k = 1$, and the item response vector can be expressed as

$$K(V_1, V_2, A, V_A | \alpha, X, Y, Z) = \prod_{i=1}^{A} Q_i^{V_i} P_i^{1-V_i}. \quad (13)$$

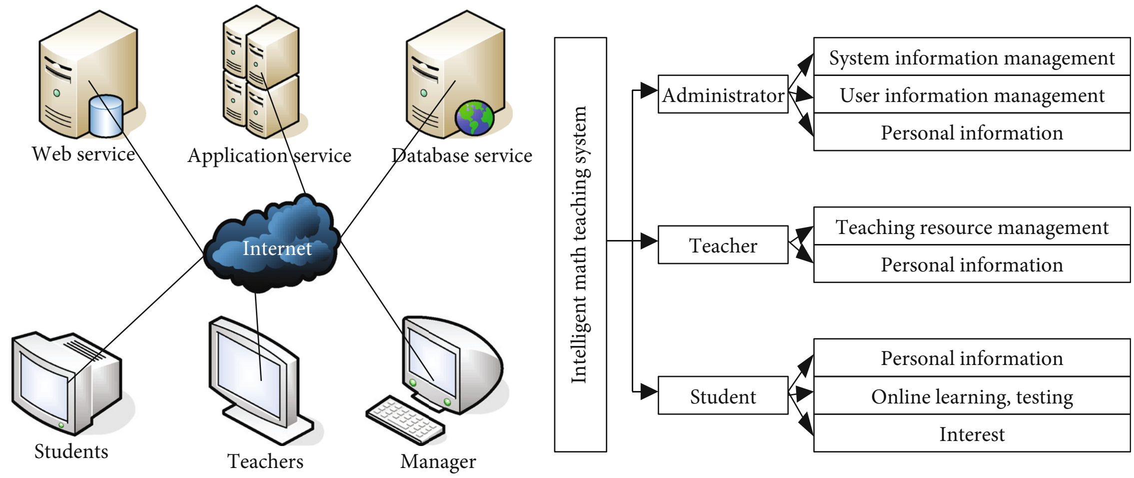

Figure 3: The functional design and system topology of the intelligent teaching system.

Table 1: Comparison of pretest results between experimental class and control class.

	Pretest				
	Number of students	Sample standard deviation	Passing rate	Excellent rate	Average score
Experimental group	41	12.1	50%	9%	56
Control group	39	58.9	53%	6%	61
Z			0.5328		
P			0.061		

Table 2: Comparison of posttest results between experimental class and control class.

	Posttest				
	Number of students	Sample standard deviation	Passing rate	Excellent rate	Average score
Experimental group	41	15.6	74%	30%	76
Control group	39	10.7	69%	21%	64
Z			2.512		
P			0.007		

Table 3: Comparison of the interest in mathematics learning between the experimental class and the control class.

	Very interested	Interested	General	No interest
Experimental group	38%	31%	20%	11%
Control group	16%	20%	30%	24%
Total	54%	51%	50%	45%

When A subjects participate in a test consisting of n items, the above formula (13) is transformed into

$$K(V|\alpha, X, Y, Z) = \prod_{k=1}^{A}\prod_{i=1}^{a} Q_{ik}^{V_{ik}} P_{ik}^{1-V_{ik}}. \tag{14}$$

Among them, Q_{ik} is the probability that subject k answers item i correctly, and P_{ik} is the probability that subject k answers item i incorrectly. α is the ability value of the subjects, and X, Y, and Z are the degree of discrimination, difficulty, and guessing degree of each item.

Through observation, it is known that formula (14) is a continuous multiplication formula, and it is very inconvenient to calculate the derivative. For the same parameter value, both achieve the maximum value at the same time. This style is transformed into the following continuous addition style:

$$\ln K(V|\alpha, X, Y, Z) = \sum_{k=1}^{A}\sum_{i=1}^{a}[\lambda_{ik} \ln Q_{ik} + (1-\lambda_{ik}) \ln P_{ik}]. \tag{15}$$

Differentiate α, X, Y, and Z to get the equations as

$$\frac{\eta \ln K}{\eta \alpha_k} = 0, \tag{16}$$

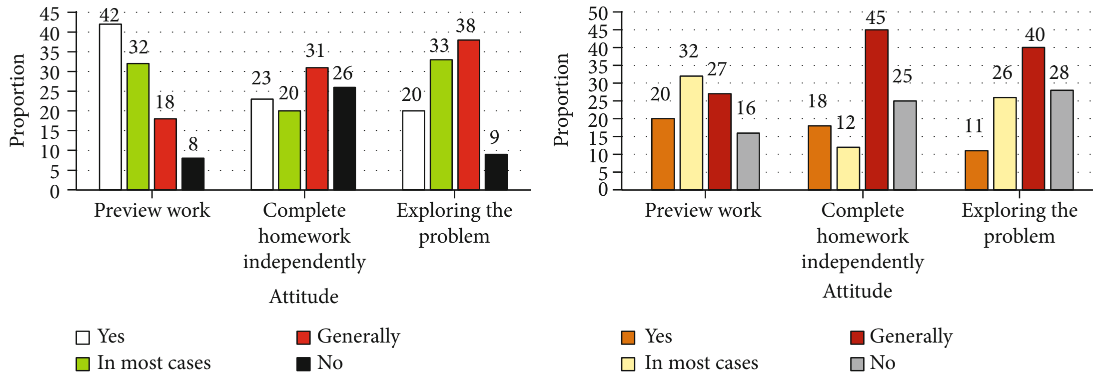

Figure 4: Statistics of learning attitude of experimental class and control class.

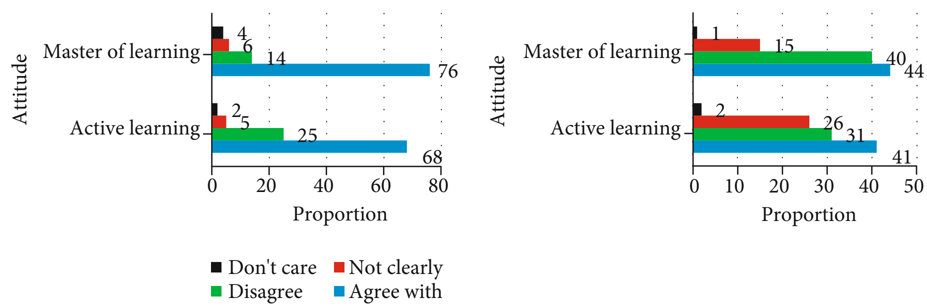

Figure 5: Evaluation of students' subjective consciousness in experimental class and control class.

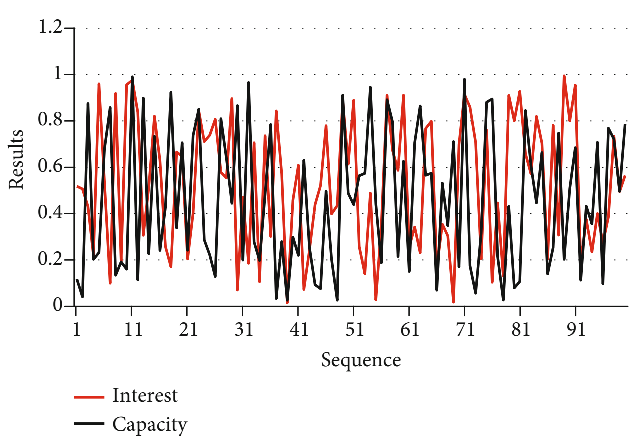

Figure 6: Students' interest performance and ability training in virtual experimental teaching system.

$$\frac{\eta \ln K}{\eta X_i} = 0, \tag{17}$$

$$\frac{\eta \ln K}{\eta Y_i} = 0, \tag{18}$$

$$\frac{\eta \ln K}{\eta Z_i} = 0. \tag{19}$$

There are four formulas on the surface. In fact, since there are A subjects and a items, each item has three parameters. Then, the parameter estimation process is transformed into the problem of solving nonlinear equations (sets).

2.4.2. Conditional Maximum Likelihood Estimation. Let $g(m) = 0$ be the nonlinear equation to be solved, m_0 is an approximate root of this equation, m is the exact root of the equation, and em is the error of the root, then $m = m_0 + em$, $g(m) = 0$ can be transformed into

$$g(m_0 + em) = 0. \tag{20}$$

The conditional maximum likelihood method has many limitations, which are mainly reflected in that when the subject answers all the items in a test correctly or incorrectly, this method cannot be used to estimate the ability of the subject.

2.5. The Key Technology of Virtual Classroom Teaching System. Virtual reality technology is the synthesis and integration of various scientific technologies such as computer graphics technology, multimedia technology, sensors, human-computer interaction technology, and simulation technology. Virtual reality technology can be divided into two categories: hardware and software. Hardware technology is mainly embodied in the development and application of sensing and display equipment. Software technology is mainly embodied in the development and application of virtual reality systems.

GIS-based virtual reality teaching is based on computers and uses multimedia equipment to achieve interactive functions in a three-dimensional dynamic environment. The system collects and transmits information such as graphics, images, and voice in real time. After obtaining the original

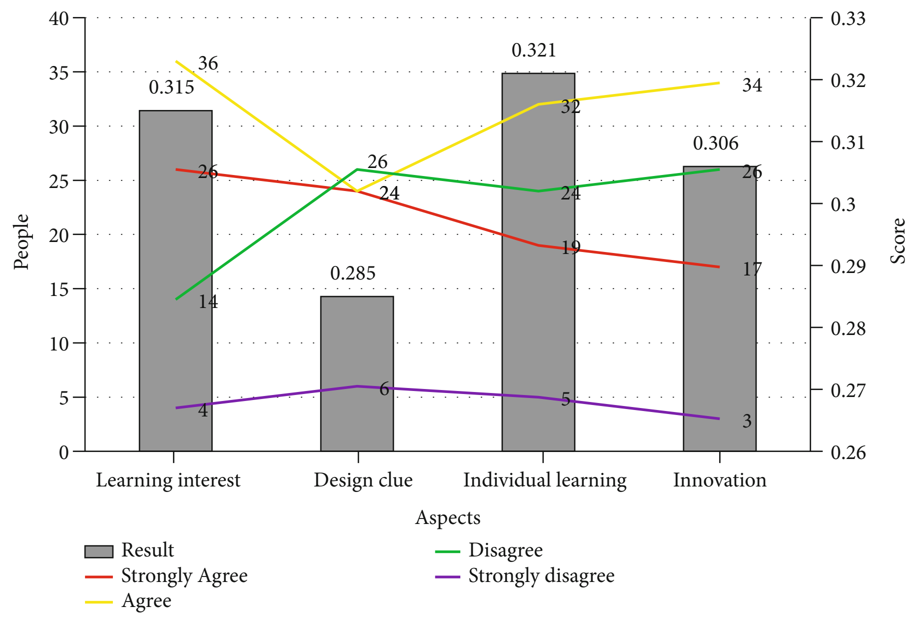

FIGURE 7: Students' attitudes towards virtual teaching.

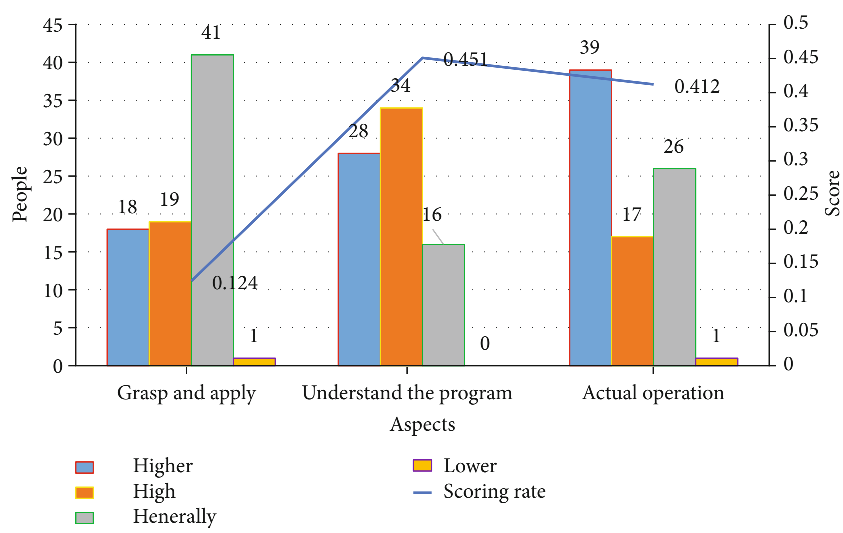

FIGURE 8: The transfer ability of knowledge learning in real experiment and virtual experiment environment.

data, the coordinates of the spatial point and the corresponding parameters (such as terrain undulation) are generated for the user to select the learning content according to the needs. Then store these data in the database for later analysis and processing. Finally, the calculation result is returned and displayed on the man-machine interface for the user to refer to, so as to achieve the interactiveness of the teaching effect.

The virtual reality system is divided into three levels. The first level is a simple virtual reality system that is a desktop virtual reality system. The system uses the mouse, keyboard, and projection screen as interactive tools. The second level is the more mature virtual reality system (hereinafter referred to as the second level virtual reality system). This level is also the virtual reality system developed by major commercial companies. It is divided into two categories. The first category is based on augmented reality. The second category is mainly AR glasses. When students are in class, they only need to wear VR glasses on their heads, and they can wander in the ocean of knowledge. The third level is an interactive full-experience virtual reality system, which can realize a full-scale, multiuser interaction, and excellent virtual reality experience. However, due to the technology and financial resources required by the system, the current education field is far from reach.

Compressing and encoding multimedia data are an essential step in the virtual classroom teaching system. Spatial data format refers to the use of GIS software to process each virtual object, convert this information into a digital form, and display and store it on the computer. After the coordinate system is determined, it is the work that needs to be done in the process of establishing the three-

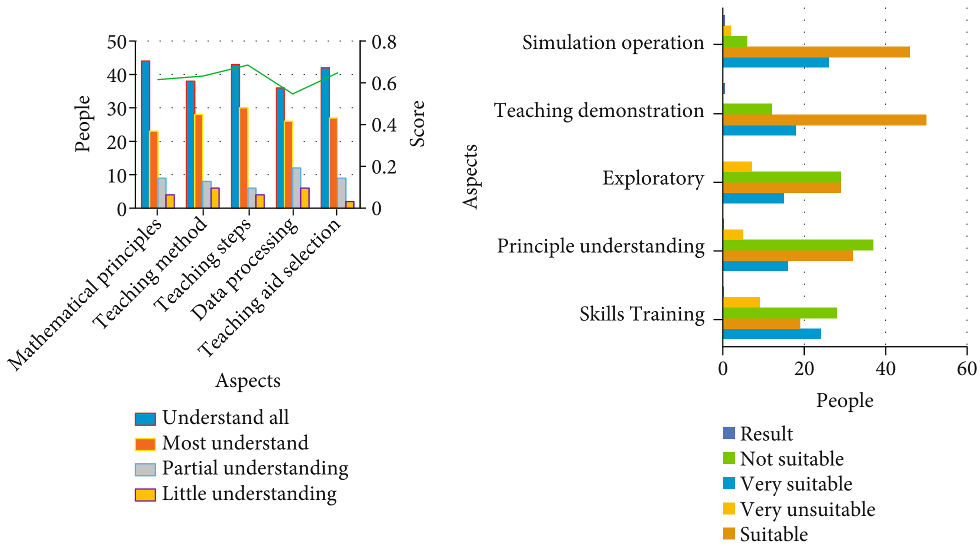

Figure 9: Students' evaluation and understanding of the applicable field of virtual experimental teaching system.

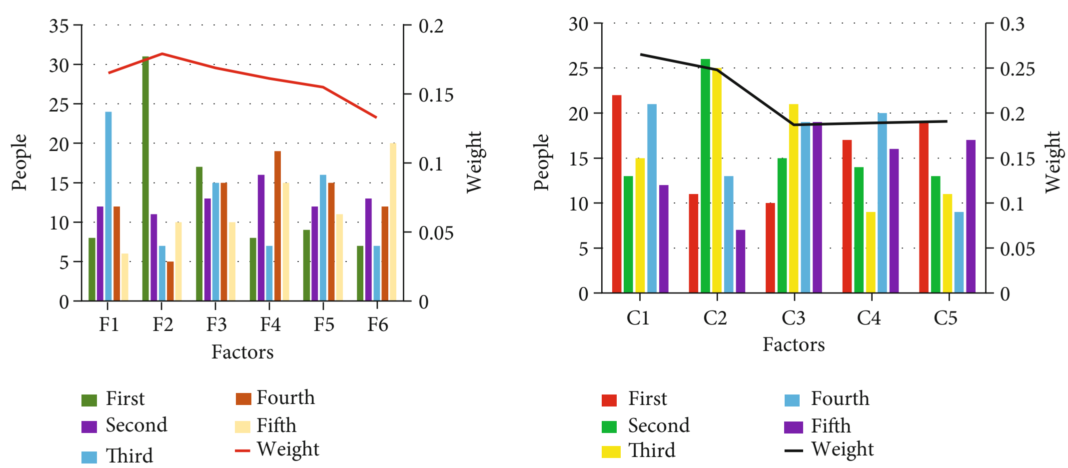

Figure 10: The advantages and disadvantages of virtual teaching and the reasons for experimental results.

Table 4: Results of closed-book test of experimental class and control class.

	Number	Average	Standard deviation	Standard error mean
Experimental class (pre)	41	92.56	3.1657	0.4506
Control class (pre)	39	89.92	3.6568	0.5125
Experimental class (post)	41	94.25	2.5132	0.6258
Control class (post)	39	90.21	2.5109	0.6425

dimensional coordinates. First, select a suitable location and set the coordinate origin according to the actual site conditions. Then set the attributes of the three-dimensional coordinates according to certain rules. Finally, it is converted into a two-dimensional spatial data format file for easy use and management, which is convenient for users to learn and train in a virtual environment. The format of spatial data means that various types of graphics can be converted, that is, a three-dimensional rectangular coordinate system can be established for any object, and at the same time, a certain accuracy must be ensured.

In virtual reality teaching, it is mainly about the processing of graphics information, but for students, they prefer the data itself. Therefore, we convert these digitized images into a two-dimensional space that can be visually displayed through certain means. This method can effectively solve the problem of the mismatch between traditional two-dimensional floor plans and real life. At the same time, it can also improve teaching efficiency and accuracy. In terms of information processing, it is mainly through the acquisition of raw data, including graphics and text. The first thing to do is to extract the required information. Make a preliminary analysis. Then, based on this preprocessing, the results are obtained and the space coordinates and virtual world model are established. Finally, use the GIS software to generate a three-dimensional solid map or attribute vector to form a new surface profile curve to display its shape characteristics and boundary conditions and to calculate the positional relationship of each point in the plane and on the plane, so as to realize the description and expression of the three-dimensional geometric form, visualization, and other functions. Through the application of virtual reality technology, we can realize three-dimensional information processing, which mainly refers to the use of GIS software, graphical language, and professional knowledge to complete the editing, storage, and display of original two-dimensional spatial data.

In the process of virtual reality teaching, teachers can acquire the knowledge they need more conveniently and quickly by processing three-dimensional information on students. The first is data collection. Use GIS software to build a three-dimensional geometric model. Then according to the requirements of different users for graphics, text, and other image elements, select the appropriate equipment for parameter settings. The second is to analyze the relationship and interaction between the research object and the background data. Finally, there are errors in the process of comparing and verifying the modeling and operation results and the size of the error range, and corresponding treatments are made to facilitate the completion of teaching tasks and provide students with a good learning environment.

3. Virtual Teaching Function Test

3.1. Virtual Teaching Function Test. In order to test whether the virtual teaching system developed in this paper can meet the requirements of various functions, tests are carried out, including virtual teaching function test and virtual practical training teaching function. This article takes elementary school mathematics as an example to elaborate on the testing process of its virtual teaching and virtual training.

System testing is a process of comprehensively testing all modules and aspects of the system. After the development of the mathematics teaching system based on. NET is completed, and we will also conduct reasonable tests on it. The test of this system mainly includes function, performance, safety, and other tests.

3.2. Development Environment Construction. Download the integrated package of Eclipse and EGL tools suitable for the computer environment in EDT Project Home, download and unzip it before use. Open Eclipse and open the Eclipse installation plug-in interface through Help- > InstallNew Software. And write the installation URL corresponding to EDT0.8 in the input box behind "WorkWith" on the page. Click the "Next" button on the page to enter the Web2.0 client application setting page with service, where the user can create a basic package name and select widget items.

3.3. Use the System to Realize the Flipped Classroom. When developing the EDT Web front-end program, the elementary school mathematics personalized intelligent teaching system needs to perform proper operations on the deployment of EDT. After operating the EDT deployment, the system will deploy the automatically generated service in the target Web program. The target code of RUIHandler and the target code of RUIHandler. At the same time, other operations such as the configuration file that should be bound to the service target code in the current EGL project will be configured in the target web program, so that users can directly deploy the target project in the application server.

Before class, the teacher puts the content to be learned into the system, and the students log in to the system to conduct self-study of theoretical knowledge before class, complete each task point in the preview, and give feedback on the students' preview situation during the formal class, for the next step, the teaching determines the important and difficult points.

3.4. Online Feedback and Evaluation of Learning Content

3.4.1. Prediction. Before conducting the experimental class, conduct a comprehensive analysis of the control group and the experimental group, compare with the students' knowledge level and learning attitude, and strive to ensure that there is no significant difference between the experimental class and the control class.

3.4.2. Posttest. During the experiment, students in the experimental group are encouraged to use the virtual experimental teaching system to complete the specified experimental tasks outside of the normal course. All learning resources of the virtual experimental teaching system can be used to control the classroom, and students only need to complete the normal course. At the end of the semester, the control group and the experimental group were tested.

4. Result Analysis

4.1. Test Data Statistics before and after the Experiment in the Experimental Class and the Control Class. Before the test, this article investigated and analyzed the conditions of the experimental class and the control class, including the number of students, grades, outstanding, and passing rates. And use the global double Z test to evaluate the difference between the two groups. It can be seen from Table 1 that before the experiment between the experimental class and the control class, the value of the significance probability P of the two classes is greater than 0.05, indicating the difference in the skills and knowledge of the students before the experimental class and the control class.

As shown in Table 2, after one semester of virtual experiment courses in the laboratory and the control class, the average score, pass rate, and excellent rate of the experimental class are higher than those of the control class, with significant differences. Facts have proved that the implementation of virtual experimental education in elementary school distance learning mathematics has a very good effect on improving students' academic performance on a large scale.

4.2. Comparison of Interest, Habits, and Attitudes of the Experimental Class and the Control Class. The data in Table 3 shows that 69% of the students in the experimental class are very interested and interested in primary school mathematics, while only 36% of the students in the control class are interested in mathematics learning. The interest of the experimental class students who are not interested in mathematics learning at the stage is also much lower than that of the control class.

As shown in Figure 4, the experimental teaching of the virtual experimental education system has stimulated students' interest in the otherwise boring and difficult basic mathematical knowledge. 74% of the students in the experimental class would read the textbook carefully before starting the experiment, while only 52% of the students in the control class would preview. Nearly 43% of the students in the experimental class think that they can conduct experiments independently through self-study, while only 30% of the students in the control class think that they can conduct experiments independently. If there are any learning problems in the course, 53% of the students in the experimental class said they would use the virtual experimental teaching system for exploratory learning, while only 37% of the students in the control group said.

All this shows that the use of the virtual experimental education system can help stimulate students' enthusiasm and initiative, generate interest in the curriculum, improve the awareness of actively using the virtual experimental education system, and learn to learn autonomously.

Figure 5 shows that there is a significant difference between the experimental class and the control class in the two assessments of subject knowledge, indicating that virtual experimental education has played the role of students' subjects and has also significantly increased students' significant subject knowledge, which shows that virtual experimental education has played a role in disciplines and has significantly improved students' knowledge of important disciplines, encouraging students to explore and innovate.

4.3. Survey on Interest Performance and Ability Development. From Figure 6, we can see that in virtual experimental education, students show a higher level of interest, attention, independent thinking, and active participation. It can be seen that virtual experiments are novel compared to traditional experimental methods, which can attract students' interest and attention and increase students' learning initiative and enthusiasm.

In terms of professional training, the effect of virtual experimental education on abstract thinking and students' thinking analysis ability is relatively ideal, but it is not ideal to promote students' overall applicability in the virtual environment.

When students use the virtual experimental education system, the statistics in Figure 7 show that more than 50% of the students believe that the virtual experimental education system has significantly increased their experimental interest and improved design ideas and capabilities, from independent enhancement and heuristic experience to stronger and innovative thinking.

4.4. Survey on the Degree of Understanding of Mathematics Knowledge. It can be seen from Figure 8 that the formation of virtual mathematics teaching experience is conducive to understanding the principles and laws, and students can apply the knowledge they have learned well in the virtual experience in actual operations. The knowledge that students have cannot be used well in the virtual experience, because the virtual experience cannot reflect the mathematical principles and rules very well. And the knowledge organization process of the student staff and the understanding of the content of the experimental course are not sufficient.

It can be seen from Figure 9 that more than 60% of students have reached the intermediate to advanced level in their understanding of teaching methods, teaching principles, tool selection, teaching methods, and data processing through the use of virtual mathematics classes. The highest score is the element of the teaching stage, indicating that students have mastered the teaching stage in the virtual environment and can complete their own learning as needed.

It can be seen from Figure 9 that students think that the virtual mathematics education system is most suitable for simulating operation experience and understanding principles. The main reason is that the virtual teaching system is based on the real world and can simulate various teaching aids during the experiment. The virtual system allows students to conveniently and intuitively use the equipment and observe the results obtained. The research field is unknown.

4.5. Advantages of Virtual Teaching and Reasons for Experimental Results. There are six main reasons that affect the effect of virtual teaching. This article lists them as F1 ~ F6. The specific ones are no collaborative experiment environment is provided, the system cannot well reflect the authenticity of the operation experiment process, and the experiment content is not systematically complete. The stability of the system and the simulation effect are poor, there is no space for exploring knowledge, and the guidance of teachers and the communication help of students are lacking. The advantages of the virtual experimental teaching system mainly have five factors, represented by C1 ~ C5. Specifically, it includes being able to not be restricted by time, space, and space, being able to try to operate equipment that is not available in the laboratory, not damaging the experimental equipment, the experimental environment is relatively safe, and being familiar with the structure, function, and purpose of the experimental instrument.

It can be seen from Figure 10 that the main reasons for using virtual experience are lack of space for knowledge, lack of teacher guidance, lack of communication support for students, and system stability and simulation effects. Facts have proved that in order to improve the efficiency of the virtual experimental education system, students must have a space for rapid positioning and communication, while ensuring the stability of the virtual experimental education system itself and the authenticity of the simulation. It needs improvement to give learners a good learning effect.

The students saw the advantages of the virtual experiment system as an auxiliary tool for distance learning: time and place are free. Experiments can be carried out easily anytime and anywhere. Expensive equipment is not available in the laboratory. And the simulated virtual experiment teaching system is also helpful to familiarize yourself with the structure of the experimental instrument. It is especially important for remote students to complete the experiment homework conveniently anytime and anywhere. It also pays great attention to the connection between virtual experience and actual operation.

4.6. Effect Analysis. It can be found from Table 4 that due to the analysis results of the SPSS software, the mean, standard deviation, and standard error of the mean are different for the two classes. Through interviews with students in the experimental class after class, most students believe that virtual reality systems are better than other methods of elementary school mathematics teaching.

Through the experiment of virtual reality system to assist in understanding mathematics teaching, it can be concluded that virtual reality system plays a significant role in primary school mathematics teaching and is conducive to the mastery of students' knowledge, improvement of grades, and enhancement of spatial ability.

5. Conclusion

With the continuous development of education informatization, the interaction between teachers and students becomes more and more frequent in the teaching process. Under the background of the rapid popularization of multimedia technology, virtual reality technology, and the rapid rise of new technology applications such as computers and network communications, the realization of teacher-student interaction has become an urgent problem to be solved. Elementary school mathematics is the beginning of logic, and the mastery of elementary school mathematics is conducive to the construction of thinking ability. Virtual reality takes real natural scenes as the research object. By creating a virtual environment, students can be immersed in it. It can provide teachers with a real and vivid environment and learning space. By simulating concrete things, it is easier for students to understand abstract concepts or mathematical models. The design of the virtual reality elementary school mathematics teaching system based on GIS data fusion has gained a lot in its research methods and impact value. The research and development of this system have brought scientific and technological civilization and convenience to human teaching.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there is no conflict of interest with any financial organizations regarding the material reported in this manuscript.

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