# Software Development for Interesting Classrooms in Primary Mathematics with Practical Scenarios

Sujing Ma<sup>1,2</sup>, Yumeng Du<sup>1</sup>, Xuemin Gui<sup>1,\*</sup>

<sup>1</sup>School of Information Science and Engineering, Hebei North University, Zhangjiakou, Hebei, China <sup>2</sup>School of Computer Science, Taylor's University, Kuala Lumpur, Malaysia \*Corresponding Author.

Abstract: The educator Piaget pointed out "all intellectual work depends on interest." The abstract, general and logical nature of mathematics makes many students feel dull and boring. In order to make students experience the lively, interesting and infinite charm of mathematics in the learning process, it is important to strengthen the interesting teaching of mathematics. Therefore, this project aims to provide primary school students with a platform for interesting experiments through the development of the "Interesting Classroom Software for Primary Mathematics", transforming boring theory into interesting practice and effectively combining practical operation with theoretical education. This paper focus on the selection of software content, software architecture design and future development prospects and forecasts.

Keywords: Primary Mathematics; Interesting Practices; Classical Experiments; Software Development

# 1. Introduction

The rapid development of "Internet+" has greatly changed the traditional education model, making the education process a simple and interesting one, which is conducive to more active learning and integration of students' knowledge [1,2]. Micro-learning resources are of great value in promoting the of development primary mathematics experiments and improving teaching [3]. Back to the essence of education, because primary school students are still young and have not formed a complete knowledge structure system, and because the teaching tasks in mathematics courses is heavy and the overall learning tasks are tightly timed, it is particularly important to teach mathematics efficiently. If we can use the convenience of "Internet+" for experimental exploration and practical teaching, it can help students to consolidate their basic knowledge, cultivate a scientific spirit and, to a certain extent, improve the teaching of mathematics at primary school level. In this context, the Classroom "Interesting for Primarv Mathematics in Practice" software was developed to link the Internet with education and teaching and to add the interesting practical aspect that is the hallmark of this software.

# 2. Software Development Content and Material Selection

Since the implementation of the new curriculum reform, the teaching of primary mathematics has paid more attention to the cultivation and training of students' mathematical thinking methods, and the new curriculum standards have also made "basic methods of mathematics" one of the four basic indicating that objectives, mathematics education should pay attention to the cultivation of mathematical ideas [4]. Therefore, this experiment intends to select some of the classical mathematics experiments in primary schools to show the classical problems in mathematics with vivid and imaginative practice sessions, aiming to inspire students to think about theoretical knowledge and improve their independent thinking ability.

So how do you define and select classical experiments? Through literature survey, we found that the so-called classical experiments are: exemplary, authoritative, historically selected "the most valuable classical", the most representative experiments that can reflect the essence of teaching content. Secondly, we take into account the fact that each grade level in primary school has different learning content and different teaching directions, and that as students grow up, their knowledge systems are gradually improved and their learning abilities vary. To address this issue, we have studied the primary mathematics syllabus and finally selected one of the most typical experiments as the main content from each of the six grades according to the new primary mathematics syllabus. For example, the fifth grade selected the classical experiment is: "using the drainage method to find the volume of irregular objects", in which a certain amount of water is put into a regular container (note: the amount of water should ensure that the irregular object can be submerged of the desired volume) and the volume of water is calculated at this moment, recorded as V1; then the irregular object is submerged in water and the volume of water is calculated at this moment, recorded as V2. Finally, the volume of the irregular object is obtained by subtracting the initial volume of water, that is, V2-V1=V irregular object.

Classical experiments are chosen because they are representative and do not change over time, and because they are more basic and richer in content and knowledge. Classical experimental scenarios are designed to make it easier for students to remember knowledge, to stimulate their thinking about the principles of the experiment and to develop mathematical thinking.

#### 3. Software Design Architecture

The UI interface of this website is designed according to the mainstream website framework. The home page is basically divided into three parts: the top mainly includes the logo map, menu bar and other content; the middle content part mainly includes the graphic list of the classical experiments of six grades; the bottom is some copyright, third party website links, etc.

The following is the design of the content structure of each graphic list secondary page on the home page of the "Primary Mathematics Interesting Class" website:

grade software development The first experiment is the "clock experiment". This experimental practice scenario has a dynamic clock, and above the clock has a simple theoretical theoretical knowledge. The knowledge and dynamic clock are combined to complete the learning of this experiment content. The second grade software

development experiment is the "line segment experiment", which has theoretical knowledge of line segments and the following diagram has differentiated questions on straight lines, rays and line segments to test the application of knowledge in combination with theory. The third grade software development experiment is "rectangle and square area and perimeter experiment", which has the theoretical knowledge of rectangles and squares, and the theoretical knowledge is followed by a theoretical practical session, the practical session to test whether the above theoretical knowledge is mastered. The fourth grade software development experiment is entitled "angle measurements". This practical has a theoretical knowledge of angle simple measurements and the experimental scenario is explained in video form. The fifth grade software development experiment is "volume of regular and irregular objects by the method of drainage". How can this be arranged to find the volume in the first place? This is a great way to get users thinking, exploring and improving their ability to arrange objects in a rational way. The sixth grade software development experiment is "experiments of circles". This practical scenario provides a graphical representation of a circle and shows the relevant content related to circles, such as radii and diameters.

The overall style is shown in Figure1: the top is the Logo guide bar and the top navigation bar, the middle is the course picture and course introduction, and the bottom is the navigation information.



Figure 1. Page Styles

Note: The content is designed to grow in order from easy to difficult according to the policy of the Ministry of Education of China.

#### 4. Scripting Language Design for Primary Mathematics Interesting Classroom Software

Software is the core of computing, and with the advancement of science and technology, people have higher requirements for software complexity and reliability. So, the construction of a software self-healing architecture based on Java dynamic programming technology can help development of information the processing technology. [5] This software development combines the current commonly used and stable language, mainly using the Vue framework for front-end development, programming for back-end and Java development. The design of the script is an important part of the design of primary school experiment resources, and only a scientific and reasonable script design can enhance the visibility and readability of the resources themselves. Specifically, the script needs to pay attention to the following aspects: firstly, the script design should be standardized and rational; secondly, the script language should be easy to understand and not overly complicated; thirdly, attention should be paid to the vividness and figurativeness of the script; fourthly, attention should be paid to the calm and friendly tone of the scripting language. [3] Use front and back-end separation pattern in the software compilation process. Spring Boot + JPA is used for the back-end, Vue framework is used for the front-end, Ajax technology is used for data interaction between the front and back-end, and the data is based on JSON format. Database uses MySQL, through JPA to achieve database read and write operations. Among them, the SpringBoot project is actually a Maven project, and the use of third-party plug-ins can be achieved by relving on Maven or Gradlel, greatly simplifying the amount of deployment.[6]

JPA framework supports concurrency, things, big data and other container-level thing processing services, and can be widely used in enterprise applications. JPA uses JPQL query statements, which are fully object-oriented, with object-oriented inheritance, polymorphism, association features, to avoid excessive coupling between traditional SQL query statements and the program.

Here we take the login page as an example, as shown in Figure 2. After the user enters the account password and clicks login on the login page, the front-end will send the account password to the back-end for command processing through the request interface. The backend receives the data and checks it to see if the account exists. If the account does not exist, the front-end will output the message "The account you have entered does not exist, please re-enter!" If the account number exists and the password is correct, the back-end returns the message "Login successful!" to the front-end. The JavaScript in the front-end extracts the information from the database, changes the database information and then implements it to the front-end page.







The background management is divided into three parts, as shown in Figure 3: the data content management part refers to storing the data content such as the carousel map through the database, and interacting with the page through the interface; The system management is divided into three roles: administrator, teacher and student, and the irrespective functions are realized by assigning different permissions. The administrator is responsible for managing the teacher and student information as well as the maintenance and update of the webpage, and the teacher is responsible for managing their own student information; The content of experiment management is the experiment of six grades, such as changing the experiment content at intervals.

#### 5. The Importance of Applying Computer Software Development Techniques

### 5.1 Returning to the Essence of Mathematics and Developing Independent Thinking Skills in Mathematics

Logical thinking should be developed as early as possible, especially in systematically learned mathematics. Only when students have mastered and enhanced their logical thinking will they be able to accept mathematical knowledge more quickly and increase their learning efficiency significantly. In addition, developing interest is an important means to stimulate learning motivation, and students who have an interest in mathematics will create favorable conditions for learning. [7,8] The software can be used in a back-to-essence-practice way to enhance hands-on skills while providing students with more space for independent thinking, making enjoyable learning and developing mathematical and logical thinking more quickly.

### 5.2 A Mix of Interest and Practice to Reinforce Students' Basic Knowledge of Mathematics

The basic knowledge of mathematics should be the most important aspect of teaching. As the saying goes, "if the foundation is not firm, the ground will shake". Only by laying a solid foundation can we achieve twice the result with half the effort in establishing good mathematical and logical thinking, and a solid foundation needs to be acquired through a lot of practice. Software can do both with an interesting tone, so that students do not learn in a boring way and fully open up their imagination; verify the knowledge by practical exercises and thus draw conclusions. Driven by interest to learn spontaneously and by acquiring more mathematical knowledge, the knowledge gained in practice is remembered deeply to build a solid mathematical foundation.

#### 5.3 Significantly Improve the Application of Mathematical Knowledge in a Practical Context

The examples in the software are drawn from life and are close to it, making it possible to be in a mathematical learning environment at all times. The rigid mathematics teaching that knowledge corresponds to one aspect in the past is overthrown, and the flexible mathematics teaching that knowledge can solve many problems is achieved. The flexibility of the use of mathematics is enhanced through practical connections, so that the student can achieve the purpose of studying and applying the knowledge creatively.

# 6. Deficiencies of Software

As the software developers of the Interesting Classroom for Primary Mathematics in Practice Scenario are undergraduate students in school and the software is not yet mature. The following deficiencies exist.

# 6.1 Lack of Software Functionality

This software is not yet fully functional and can only achieve simple basic teaching. The page content is perfect, and the login and registration functions are perfect. Some of the drag and drop functions in the experimental content are not yet implemented.

# 6.2 Lack of Experimental Content

There are only six experiments, one for each grade in primary school, and they do not cover all of primary mathematics knowledge.

# 6.3 Difficult to Maintain Software Updates

Undergraduate students in school have daily study and living arrangements as well as the constraints of learning content technology, which can result in deficiencies in software updates and maintenance.

# 7. Development Trends and Forecasts

Primary education is the foundation of the whole educational endeavor, and to improve the quality of the whole educational endeavor, it must start with primary education. And primary education is not just about stereotypical teaching. It is about guiding students to learn. Moreover, having good mathematical and logical thinking is necessary in life, and there will be many inconveniences in life without a certain amount of mathematical knowledge.

On August 11, 2021, the Ministry of Education announced that the Office of Education Supervisory Commission of would establish a monthly notification system on the implementation of the "double reduction" policy in various places, in addition to which the Ministry of Education has repeatedly announced the deployment of management measures to strengthen the prevention and control of the epidemic. From this we can see that classical learning content and online exploration learning has become the best choice nowadays. At present, the state strictly requires "zero-start" education, forbids early learning of primary school content in kindergartens, and does not allow after-school homework of more than 1.5 hours in the first and second grades of primary school... This shows that the state will really implement a policy of teaching from easy to difficult according to age.

It is assumed that this project has an advantage in the light of the requirements of "double reduction" policy and epidemic prevention and control. The project is designed to develop students' independent learning skills in a guided manner based on their interests, so that they can explore their learning automatically and learn more about mathematics without adding to their learning burden. The process of mathematical designing experiments is essentially a process of exploration and innovation that enables students' thinking activities to mature as quickly as possible. It also develops students' thinking and enables them to develop basic ideas for independent learning of mathematics. [9,10] In the context of national advocacy of innovation, cultivating students' innovative thinking and independent learning has become a trend, for which guided interesting learning software will occupy a very important place in the market.

# 8. Conclusion

Basic education in mathematics is the mainstay of national education development, and it is important to practically strengthen basic mathematics education, strive to implement quality education and give full play to the advantages of basic education in China. In today's era of rapid development of information technology, the classroom of mathematics education has also been given a new development. In the past, traditional lessons were taught in a theoretical way only, and the mode of instruction was only for the teacher to lecture and for the students to listen. But today's society has more flexible and strict requirements for learning. Each generation of children will face a harsher and harsher social environment. Therefore, the rigid way of traditional teaching can no longer meet the current demand. In order to expand students' thinking and make them more flexible, the classroom also needs to add practical elements, so that students can participate in the practice and master the knowledge more flexibly.

This software has been designed to increase the practical nature of the classroom. The significance of this software design is to bring primary mathematics back to practical education learning, and learning materials selected from the classical experiments in knowledge mathematics makes more authoritative and exploratory, and makes the mathematics classroom education "live", so that the mathematics classroom should not only carry out theoretical knowledge teaching, but also cultivate students' ability of hands-on learning practice. independent and independent thinking. As the saying goes, "it is better to teach people to fish than to give those fish". Instead of summarizing the results directly, students should be taught how to explore and learn, and gain valuable knowledge and learning skills in the process of exploration.

In addition to this, the software aims to attract children's interest in learning by means of experimental teaching, thus cultivating children's interest in mathematics and logical thinking from an early age, thus implementing the spirit of independent learning and laying a solid foundation for the future development of mathematics education.

#### Acknowledgments

This work was supported by Science and Technology Department of Hebei Province, Special project of cultivating scientific and technological innovation ability for college and Middle school students (Practice situation under the primary school mathematics interesting classroom software development 2021H070306), Hebei Higher Education Society, Higher Education Science Research Planning Project (Development and research of Public Mathematics Experimental System in colleges and universities GJXH2019-005), Education and Teaching Reform Research Project of Hebei North University (GJ202140).

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