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Application of powerpoint and the visual basic for applications programming language in interactive educational software

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Abstract

This paper explores the application of Microsoft PowerPoint and the VBA (Visual Basic for Applications) programming language in the development of interactive educational software. As a widely used presentation tool with its user-friendly interface and multimedia support, PowerPoint has gradually been adopted in the education sector for creating creative teaching materials. By combining it with the VBA programming language, users can further customize and enhance PowerPoint's functionalities to meet the unique needs of educational software. This paper proposes designing and developing interactive presentations based on the VBA programming language. By invoking PowerPoint 2007 operation, a macro can be enabled when opening the courseware to ensure that the VBA code can run properly to achieve the interactive questions and answer functions. Presentations made by this method are highly interactive, which can stimulate students' motivation, enrich classroom teaching tools and improve teaching effectiveness. Finally, This paper discusses creating an interactive presentation that can include dynamic selection, control, and playback of audio files, the future potential of PowerPoint and VBA in the education field, and possible challenges and avenues for development. The findings of this paper suggest that the combination of PowerPoint and the VBA programming language can effectively create interactive educational software, enhance teaching effectiveness, and provide students with more engaging and enjoyable learning experiences. However, this also requires educators and developers to have a deep understanding of the potential of these tools to leverage their advantages and address potential technical challenges fully. Teachers use various methods wisely, master the teaching process flexibly and creatively, stimulate students' interest, and cultivate their creative thinking and comprehensive application of VB development skills, contributing to China's education development.

Keywords: Interactive teaching, VBA, automation language, teaching ai

1. Introduction

Current information technology has become an effective means for human beings to acquire knowledge, and its convenience, rich content, and extensive relevance in acquiring knowledge are very much in line with the characteristics of divergent human thinking. PowerPoint is among the software in the MS Office suite. It has become one of the preferred presentation production tools due to its easy-to-learn operation and friendly and intuitive interface. However, PowerPoint alone has limited presentation interactivity, and the user can only follow a producer's intention.

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VBA greatly enhances PowerPoint software and makes PowerPoint more efficient and widely available. VBA in PowerPoint allows for many complex interactions, and its powerful programming capabilities make PowerPoint courseware easy and fast to create, with flexible, interactive functions to promote classroom teaching, which is lively and interesting, greatly enhancing the effectiveness of multimedia PowerPoint courseware to aid teaching. It can improve the efficiency of school education, put the results into action in the three areas of teaching and teaching support, subject integration and information technology education, and improve the information technology and efficiency of work.

Using VBA in PowerPoint: (1) Open PowerPoint and create a new blank slide. (2) Select "View → Toolbar → Control Toolbox" to display the box. The Control Toolbox provides various kinds of controls for making PPT courseware controls. (3) Click the corresponding control in the Control Toolbox with the mouse, and then use the mouse to the slide editing area. (4) Press the mouse's left button and drag the mouse simultaneously to draw a control on the PPT. (5) Select the control and click the Properties button in the Control toolbox. You can now edit the properties of the control. (6) Double-click the control and add VBA code to complete the corresponding function.

The VBA language was used in PowerPoint to create interactive teaching courseware to enrich classroom teaching tools and create a good learning experience for students. As an additional teaching tool, PowerPoint has a strong multimedia presentation function. It can display text, images, sound and other multimedia elements effectively and concentratedly, but the interactive functions that can be applied are relatively weak. To give full play to the comprehensive performance of PowerPoint-assisted teaching, the author conducted a preliminary study on the Office VBA language, which integrated with PowerPoint software, explored the interactive aspects of PowerPoint, realized interactive functions with certain usability, initially met the interactive needs of teaching, and received good results in the practical lectures.

The VBA application in PPT further demonstrates the practicality of VB language, gives students a complete understanding of various practical applications of VB, triggers students' interest in exploring and studying VB applications in-depth, and improves students' self-learning ability and creative needs. This example demonstrates teaching breaks in the previous classroom based on the logical structure system of knowledge points, which benefits teaching in China.

1.2 Literature Review

Robinette suggests that "multimedia is about combining sight, sound, and to create a different feeling than simply reading text or watching video at leisure" (1995, p. 10). Goldberg says, "Multiple media, which I use to describe the cool new media that I've been talking about, which is the combination of virtual/visual elements and interactivity. A typical multimedia program may include any combination of text, pictures, computers, images, audio, and video" (1996, p. 14).

Multimedia is defined as including a variety of media that are interactive. A typical presentation (using PowerPoint or other presentation tools) refers to the size of the media, not the interactivity. When enhancing a lecture to present to an audience, interactivity is not necessary interactivity is not important. However, when creating items over which students have control, choosing where to go in the project and well-designed interactivity are very important.

Help students learn by creating more opportunities for them to take control of their learning. Give them control of their learning and access them through different sensory senses. When

you design multimedia presentations for your students, you need to decide what is most appropriate. Sometimes, a picture is worth a thousand words; sometimes, a few words are worth a thousand pictures; and sometimes, for a struggling reader, it is, for example, the spoken word is more important than everything else.

1.2.1 Definition of VBA

VBA (Visual Basic for Applications) is a new generation of standard macro language developed by Microsoft for customizing and extending the system of Office functions and is part of the Office components. It provides an object-oriented programming approach and a fairly complete programming language and uses the same programming environment as Visual Basic. VBA is a macro language for Visual Basic, a programming language that Microsoft developed to perform common automated (OLE) tasks in its desktop applications. It can be used to extend the functionality of Windows applications, especially Microsoft Office software. Microsoft developed the language in 1993 for applications sharing a common automation language--Visual Basic For Application (VBA); VBA is a parasitic version of VB applications. Microsoft released Excel 5.0 in 1994, which has a VBA macro function.

Someone can use VBA in common office software, and VBA can make the application of Office software like Word, Excel, Access, and PowerPoint more efficient. For example, through a VBA code, you can achieve a screen switch and reach complex statistics logic (such as from multiple tables automatically generated by the contract number) to track production volume, sales, and inventory statistics.

1.2.2 Characteristics of VBA

VBA has three features: (1) VBA makes existing applications automatic; (2) VBA must be parasitic on existing applications; (3) programs developed by VBA must depend on its parent application (e.g., in PowerPoint).

First of all, VBA is a programming language. Having a background in computer science and programming will be helpful. You cannot take full advantage of VBA if you are not a novice. However, this article guides you through some basic things you might want to do with VBA without any programming background. VBA (Visual Basic for Applications) is a general-purpose Visual Basic programming language developed by Microsoft. It makes it easy to call and customize objects for major applications. VBA is embedded in Microsoft Office software and extends the application's functionality. As needed, users can write VBA macro code to create custom solutions that automate repetitive tasks and increase productivity. The development and operation of VBA depend on the main application. VBA embedded in PowerPoint is used to accomplish intelligent interactive topic selection.

1.2.3 Related Studies

Scholars in China have conducted research regarding the production of multimedia courseware. Zhang and Niu (2018) elaborated that multimedia teaching equipment has become popular with the advent of the information age and the continuous improvement of teaching equipment. Tang (2018) noted that presentation production technology has become a necessary skill, no matter what profession you are engaged in, and mastering a good PowerPoint presentation can help achieve twice the results with half the effort. Ma (2017) said that with the continuous development of modern education technology, using PowerPoint to create courseware has become an essential teaching skill for teachers. He also noted that most courseware teachers produce lacks interactivity; thus, the effect of teaching aids was not

outstanding. Shi (2020) said that PowerPoint was widely used in teaching and learning, focusing on analyzing PowerPoint as a tool for multimedia courseware production. Xiang (2007) introduced design principles and practical skills when making multimedia courseware with PowerPoint. He argued that the production process should be based on teaching theory and give full play to PowerPoint's basic advantages and flexibility to enhance courseware interactivity and improve teaching quality.

Some examined the use of VBA in creating interactivity. Jin (2015) emphasized that VBA could extend the complex interactive functions of PowerPoint courseware. Through its powerful toolbox of controls and programming capabilities, VBA can make PPT courseware interactive and flexible, develop beautiful and practical multimedia interactive PPT courseware to assist classroom teaching, enhance the effectiveness of subject classroom teaching, and improve the quality of subject teaching. Zhang (2021) said that the VBA macro language with PowerPoint could be used for programming to draw inorganic chemical equations quickly. For example, the program analyses the basic information entered into the equation, automatically changes the length of the equal sign according to the number of reaction conditions, automatically analyses and changes the number format to a subscript if required, and automatically analyses and adds gas or precipitate symbols after the products if required. The equations produced by the program are aesthetically pleasing and have good practical value.

Scholars abroad also conducted research on the production of multimedia courseware. John & Jane (2018) explore the use of PowerPoint as an interactive tool in higher education. The authors discuss the integration of VBA to create interactive quizzes and simulations within PowerPoint presentations. They highlight how this approach enhances student engagement and learning outcomes. Michael and Jennifer (2019) examine using VBA to collect and analyze data from interactive PowerPoint presentations. It discusses how VBA can provide educators valuable insights into student performance and engagement. Sarah Adams et al. (2018) investigate the use of VBA to enhance accessibility features in educational software created with PowerPoint. The authors discuss how VBA scripting can improve the usability of educational materials for learners with disabilities.

The above literature review shows that the VBA programming language is vast and sophisticated, and it is essential to master VBA in multimedia PowerPoint courseware to improve the efficiency of PowerPoint interactive courseware development. Therefore, this paper examined PowerPoint and the VBA programming language in interactive education software to enhance students' interests, widen classroom teaching tools, and increase lecture effectiveness.

The application of PowerPoint is combined with VBA language in interactive teaching courseware, which is innovative. The author searched the relative literature reviews and found that people seldom investigated the application of PowerPoint and the VBA programming language in interactive educational software, indicating a research gap. Addressing these research gaps can help educators, instructional designers, and developers harness the full potential of PowerPoint and VBA for creating engaging and effective interactive educational software while addressing important considerations related to accessibility, inclusivity, and learning outcomes.

In classroom teaching, teachers hope that students can actively participate in teaching practice, share knowledge and exchange understanding between teachers and students, and change the traditional one-way teaching mode of teachers teaching knowledge and students passively receiving knowledge. Therefore, interactive teaching is becoming more and more prominent in current classroom teaching and is also getting more and more attention from teachers and students.

Teaching interaction makes the communication between teachers and students more adequate so that teachers can better understand students' mastery of knowledge, discover students' cognitive ambiguities, promptly guide students to correct their misconceptions and deepen their understanding and awareness of the knowledge points taught. Meanwhile, students can better digest and absorb knowledge in the interactive process, use the knowledge learned to solve problems, test their proficiency in knowledge mastery, and, at the same time, form a more visual cognitive memory in their minds. The students can digest and absorb the knowledge better, apply their knowledge to solve problems, test their mastery, and form a more visual cognitive memory.

With the wide popularity of information technology, PowerPoint and other computer applications have been gradually integrated into teaching practice. Even though the efficiency of classroom teaching has been greatly improved, it also receives more desirable teaching effects. In many years of teaching practice, the author deeply appreciates that PowerPoint has played an increasingly important role in aiding teaching, providing a convenient platform for examiners to apply information technology and multimedia technology to show teaching content and teaching ideas, and has become an indispensable information technology teaching tool for lecturers. For this, the following problems are put forward:

- (1) What is the interactive courseware demonstration's effect?
- (2) How is the interface designed?
- (3) How is code implemented?
- (4) How is the courseware used?

Research Methodology

Application of PowerPoint and the VBA programming language in interactive educational software is a new teaching way whose research methodology is as follows:

1. To use the interactive question-answering function normally, you need to modulate PowerPoint security to medium or low before opening the courseware; take PowerPoint 2007 as an example, open the Tools menu, select Macro, further select Security, then modulate the security level to medium or low.
2. Select Macro when opening the courseware to ensure that the VBA code can run normally to achieve interactive question-answering functions and restore the original security level of the system after the courseware presentation.

Results

3.1 The Interactive Educational Software Demonstration Effect

PPT supports the use of the VBA programming language to implement interactions between application objects. Define the outcome of the interaction by inserting various controls into the slide and writing the associated program code in the event procedure of the control. Combining with the traditional teaching methods, the author took the lesson on Music in Module Three of Compulsory Two of the Foreign Research Edition as an example and applied PowerPoint 2007 to create the courseware used in the practice class, which was designed to achieve the fill-in-the-blank questions highlighting the interactive function. During the lesson presentation, the teacher shows the students the fill-in-the-blank questions through the Practice interface and browses the contents of the questions together, as shown in the Figure below.


Module 3 Music		Consolidate		
Practice	<p>■ Moz art was <u>1</u> (possible) the greatest <u>2</u> (music) genius of all time. While he was still a teenager, Mozart already <u>3</u> Europe <u>4</u> (give) concerts <u>5</u> a big star. <u>6</u> his lifetime of 35 years, he <u>7</u> over 600 pieces of music. In 1781, Mozart met Haydn and made a deep <u>8</u> (impress) on him. <u>9</u> he was 14, he had composed many pieces for the harpsichord, piano and violin, <u>10</u> for orchestras.</p>			 <p>Wolfgang Amadeus Mozart (1756-1791)</p>
Answers	<p>1 <input type="text"/> 2 <input type="text"/> 3 <input type="text"/> 4 <input type="text"/> 5 <input type="text"/> 6 <input type="text"/> 7 <input type="text"/> 8 <input type="text"/> 9 <input type="text"/> 10 <input type="text"/></p>			
<p>提交显示得分 <input type="text" value="0"/></p>				

Figure 1 Display the question content interface

PowerPoint (PPT) can be effectively utilized in conjunction with the VBA programming language to facilitate interactions between application objects. This interaction can be defined by incorporating various controls into slides and crafting the associated program code within the control's event procedure. In an effort to integrate these technological advancements with traditional teaching methods, a practical case study was conducted. This study focused on a Music lesson within Module Three of Compulsory Two from the Foreign Research Edition curriculum. Here, PowerPoint 2007 was employed to create courseware tailored for practical classes. The primary goal was to enhance the educational experience by introducing interactive elements, such as fill-in-the-blank questions.

During the lesson presentation, the teacher employed the created courseware to engage students actively. The instructor showcased fill-in-the-blank questions using the Practice interface, providing students a unique and interactive learning opportunity. The teacher and the students navigated through the questions' contents, fostering a collaborative learning environment. This approach leveraged modern technology and enriched the pedagogical experience by encouraging student participation and interaction with the course content. Such innovative methods potentially transform traditional teaching practices, making learning more engaging and effective. Students fill their answers in the answer area with the computer keyboard and mouse assistance, as depicted in the interface image below.


Module 3 Music		Consolidate		
Practice	<p>■ Moz art was <u>1</u> (possible) the greatest <u>2</u> (music) genius of all time. While he was still a teenager, Mozart already <u>3</u> Europe <u>4</u> (give) concerts <u>5</u> a big star. <u>6</u> his lifetime of 35 years, he <u>7</u> over 600 pieces of music. In 1781, Mozart met Haydn and made a deep <u>8</u> (impress) on him. <u>9</u> he was 14, he had composed many pieces for the harpsichord, piano and violin, <u>10</u> for orchestras.</p>			 <p>Wolfgang Amadeus Mozart (1756-1791)</p>
Answers	<p>1 possible 2 musical 3 toured 4 giving 5 as 6 During 7 composed 8 impression 9 By the time 10 as well as</p>			
<p>提交显示得分 <input type="text" value="0"/></p>				

Figure 2 Student answer interface

In the context of interactive educational software, students actively engage by inputting their answers into designated areas using the computer keyboard and mouse. When the students finish answering the questions, the teacher clicks the "Submit to Show Score" button, and the computer checks the answers in the background and calculates and displays the scores of the questions.

Module 3 Music				Consolidate	
Practice	<p>■ Mozart was <u>1</u> (possible) the greatest <u>2</u> (music) genius of all time. While he was still a teenager, Mozart already <u>3</u> Europe <u>4</u> (give) concerts <u>5</u> a big star. <u>6</u> his lifetime of 35 years, he <u>7</u> over 600 pieces of music. In 1781, Mozart met Haydn and made a deep <u>8</u> (impress) on him. <u>9</u> he was 14, he had composed many pieces for the harpsichord, piano and violin, <u>10</u> for orchestras.</p>				
Answers					
1	possible	2	musical	3	toured
6	During	7	composed	8	impression
4	giving	5	as		
9	By the time	10	as well as		
提交显示得分				80	



Figure 3 Submission display score screen

After answering the questions, students conclude their task and the teacher proceeds by selecting the "Submit to Display Scores" button. Subsequently, in the background, the computer assesses the responses, calculates the scores for each question, and then presents the outcomes to the teacher and the students. The teacher clicks on the "Answer" tab to enter the answer explanation interface, combining the student's answers to correct errors and explaining the correct answer and related knowledge points.

Module 3 Music				Consolidate	
Practice	<p>■ Mozart was <u>possibly</u> (possible) the greatest <u>musical</u> genius of all time. While he was still a teenager, Mozart already <u>toured</u> Europe <u>giving</u> (give) concerts <u>as</u> a big star. <u>During</u> his lifetime of 35 years, he <u>composed</u> over 600 pieces of music. In 1781, Mozart met Haydn and made a deep <u>impression</u> (impress) on him. <u>By the time</u> he was 14, he had composed many pieces for the harpsichord, piano and violin, <u>as well as</u> for orchestras.</p>				
Answers					
1	possible	2	musical	3	toured
6	During	7	composed	8	impression
4	giving	5	as		
9	By the time	10	as well as		
提交显示得分				80	

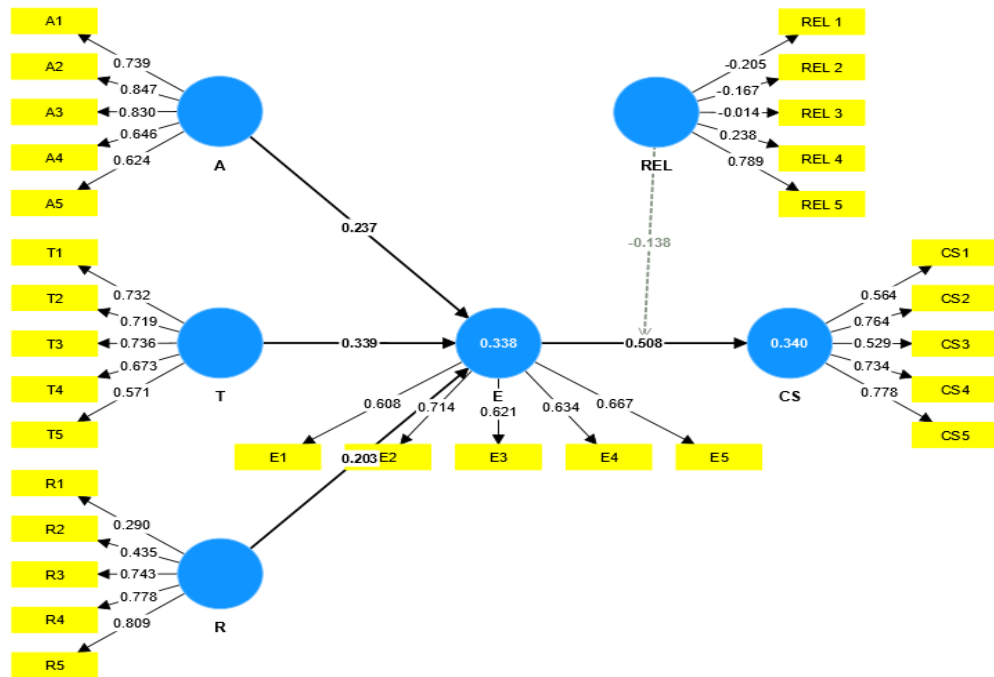


Figure 4 Answer explanation interface

To foster a comprehensive learning experience, the teacher navigates to the "Answer" tab, gaining access to the answer explanation interface. Here, the teacher merges students' responses to rectify errors and provides detailed explanations for the correct answers, accompanied by relevant knowledge points.

3.2 Improve students' grades and teaching effectiveness

The following Figure presents an interactive presentation of dynamic selection, control, and playback of audio files, motivates students' motivation, uses a macro to ensure the VBA code runs correctly, and enhances teachers' teaching effectiveness and students' grades.



A: dynamic selection of audio files, T: control of audio files, R: playback of audio files, E: motivation, REL: Macro, CS: students' grades

Utilizing PowerPoint in conjunction with the Visual Basic for Applications (VBA) programming language to develop interactive educational software offers the potential to significantly enhance both teaching effectiveness and student grades. The illustration below showcases an interactive presentation featuring dynamic audio file selection, control, and playback. This engaging approach not only boosts student motivation but also employs a VBA macro to ensure the flawless execution of the underlying code. Consequently, this synergistic combination empowers educators to deliver more effective teaching, improving student academic performance.

5. Discussion: the Design and Implementation of Educational Software

5.1 Design and Implementation Principle

To achieve the interactive function of PowerPoint, the courseware's design mainly uses VBA automation language (Visual Basic For Application). VBA language is a subset of the application of Visual Basic programming language, is a common automation language shared by Microsoft Office software and other related applications, and uses an object-oriented programming approach to provide users with a solution for creating custom applications and effectively increasing the degree of automation and innovation of office software.

Based on the command buttons, selection buttons, and other controls provided by VBA, users can design interactive application interfaces and write the related program code to achieve the intended interactive functions. The control properties allow you to modify the name, display label,

display position, appearance size, and other properties of the control and write program code in the code window to enable the control to execute code in an event-driven manner to achieve predefined functions. For example, add a "Command Button" to the PowerPoint motherboard, first select the "Command Button" in the control toolbar, drag and drop it into the PowerPoint motherboard, then double-click its icon, and in the window that appears afterwards, select Properties in the Name option to determine its name as MsgBox1, write "Prompt Message" in the corresponding item in Caption, and enter the Click event code in the Code window.

When users click this command button during the PowerPoint presentation, the event code will be triggered to display a "Welcome to the world of VBA!" prompt message. According to the above method steps, the practical teaching needs can be designed to achieve more interactive features in the PowerPoint document.

5.2 Interface Design

The interface design of the courseware is divided into three areas: question display area, answer area, and submit command. The question display area is used to display the content of the fill-in-the-blank questions, the answer area is used for students to fill in their answers one by one and practice their answers, and the submit command area is used to submit students' answers to the system and check their scores.

In the question display area, tabs are used for navigation, and two tabs, Practice and Answers, are set in the PPT motherboard to guide students to answer the questions and instruct teachers to explain the answers respectively and to demonstrate in the same PPT presentation page, which ensures the continuity of answering and explaining operations and eliminates the sensory jumps brought to students by page jumping. The VBA Project incorporates controls into Microsoft PowerPoint objects for management and variables from the programming into modules for management.

6. Conclusion

PowerPoint integrates VBA language, which shows us a field of free innovation and creates the conditions for fully realizing teaching information. In practical application, with VBA technology support, interactive teaching can be realized to create a better learning experience for students, which has received better results and is well received by students. Therefore, applying PowerPoint and the VBA programming language in interactive educational software technology is worthy of further exploration and practice.

The application of PowerPoint and VBA in interactive educational software has the potential to revolutionize teaching and learning. These tools enhance interactivity, teaching effectiveness, student engagement, and content customization, ultimately improving educational outcomes. However, addressing challenges and continued research efforts are essential to fully realize these benefits and advance the field of interactive educational technology.

This paper proposes using Office built-in PowerPoint VBA programming by calling the Windows 2000 operating system. The VBA language specification is the basis for implementing advanced interactive features in PPT courseware. Only by mastering the language specifications of VBA can you comfortably apply VBA programming to advanced interactive features of PPT courseware, such as linking questions, fill-in-the-blank questions, drag-and-drop effects, and teaching games. Practice shows that such interactive presentations enhance interactivity and can create an active atmosphere.

Innovation in teaching methods is always an important topic in teaching reform. In the process of VB teaching, teachers should combine various teaching methods with the actual situation of students and flexibly use case, task-driven, problem-based learning, project-driven and other teaching methods; the teaching effect will be more significant.

Hence, in teaching, teachers should concentrate on the following points: (1) Teachers should integrate the original knowledge of the textbook, stimulate students' interest in learning, and promote independent learning. By allowing students to watch, imitate, explore and comprehend in actual operation and summarize and conclude promptly, students can receive new knowledge in a relaxed and pleasant atmosphere. (2) Create learning situations to deepen learning understanding.

Application of PowerPoint and the VBA Programming Language in Interactive Educational Software can promote students' deeper understanding and mastery of the material and stimulate their imagination.

(3) Strengthen classroom interaction and increase the sense of participation. Teachers actively explore and summarize according to teaching contents and students' actual situation, gradually improve teaching contents, adjust teaching methods, improve teaching quality, and achieve the purpose of applying learning to application. At the same time, the characteristics of VB knowledge are faster and require us to constantly learn new professional knowledge and professional skills to adapt to the requirements of education in the new modern form.

(4) Emphasize practical teaching and enhance VB development ability.

Application of PowerPoint and the VBA Programming Language in Interactive Educational Software can cultivate students' ability to analyze problems, solve them, research and explore them, and let students comprehensively apply what they have learned to solve practical problems and improve their comprehensive application and hands-on skills, which in turn cultivates their software development skills, develops their potential and improves their performance.

In conclusion, teaching methods are an important link for teachers to teach, a necessary condition for completing teaching tasks, and an important guarantee for improving teaching quality. Therefore, applying VB language to PowerPoint teaching can achieve twice the effect with half the effort. The application of PowerPoint and VBA programming language in interactive education software is of great significance, which contributes to the improvement of Chinese class quality, at the same time, and upgrades students' interests and grades. Findings indicate that educators appreciate the flexibility and ease of use of PowerPoint and VBA for creating interactive educational content. This empowers teachers to design and adapt materials according to their teaching objectives and students' needs.

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