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## The Application of Mind Mapping into College Computer Programming Teaching

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### Abstract

Mind mapping is an effective diagramming tool which can be used to generate, visualize, structure, and classify ideas, solving problems etc. In this paper we focus on mind mapping application in programming language teaching for application-oriented undergraduate colleges. We adopt mind mapping teaching method to design and transform the abstract and invisible thinking mode into visible and radioactive thinking mode according to the teaching contents. The analysis and teaching practice show that it can strengthen the students' ability of logical thinking and innovative thinking, motivate the development of students' life-wide learning thinking, and enhance the students' understanding.

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*Keywords:* mind mapping; university; computer programming

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### 1. Background

In China, mind mapping is mostly applied in teaching, enterprise management and personal knowledge management area, and its research focuses on three aspects: ontology, teaching application and software [1]. According to the international research, several studies have concluded that mind mapping has good performance in motivating students' thinking development, especially in the development of innovative thinking [2, 3]. Because of misunderstanding that programming is conceptually abstract and boring, many students give up computer programming languages during their study. We apply mind mapping as a new teaching method to teach computer programming languages using interest-oriented teaching method with emphasis on the visual impact. This method can

help students master the learning method, cultivate students' divergent thinking and innovative thinking, Furthermore it can improve students' problem-solving skills.

## **2. Mind mapping presents the visualization of thinking**

Mind mapping is an expression of radioactive thinking and therefore the natural function of human thinking. Also it is a very useful graphical technology and a master key which can open the potential of the brain [4]. Mind mapping, which is also known as the brain or mind map, is an innovative thinking mode introduced by Tony Buzan, the famous British psychologist in 1960s. The mind map combines the concepts of the whole brain which includes the logic, sequence, ordinances, words and numbers of the left brain, and the image, imagination, color, space, and the whole of the right brain [5]. The mind mapping is a kind of illustrated thinking tool. The users combine words, pictures, symbols and other information representational tools. It realizes the visualization of the perception representation by presenting the relationship of hierarchy and thinking sequence between them.

## **3. The application of mind mapping in computer programming courses**

Mind mapping is a thinking tool which uses diagrams and networks to realize storing, organizing, optimizing and exporting information [4]. By using mind mapping, teachers can illustrate knowledge and teach the students how to design. And teachers can establish teaching steps by which then can help students to build study steps. Thus using mind mapping teaching method can promote teaching effect of the teacher and the students' meaningful learning. The application of mind mapping can help to store and extract the information. And it can improve learners' understanding and learning efficiency [5]. Once participating in as professional course, the students take a general overview of the course. With the introduction, the teacher can help students understand the curriculum and make it clear that teacher is teaching the course rather than teaching the book [7]. We can use mind mapping to make the pictures of the syllabus, and build links between knowledge points. We can help students to broaden the knowledge area and help them master the regular pattern of learning.

### *3.1. Mind mapping builds the knowledge system of courses*

According to constructivism, a structured knowledge system is an effective way to reduce cognitive load [8]. Using the layered structure diagram of mind map to show the general knowledge structure of the course can help teachers in induction and deduction of courses. With interesting graphics and divergent thinking mode to understand content, students learn to activate their learning enthusiasm. It can cultivate students' ability of learning thinking and innovative their thinking. Thus teachers can make problems hierarchical, systematic and simplified. The design of the course knowledge structure mind map with an example of computer VB programming language course teaching is shown in Fig. 1.

The mind mapping in Fig. 1 can help students to make clear the course's main content, the specific teaching goal, the teaching content of the abstract expression visually, and can impact on the courses of follow-up study about the role of guidance and bedding. Mind mapping, with the characteristics of knowledge visualization, thinking concretization, thinking individuality and infinite extensibility, is a teaching mode to visualize the invisible thinking and it makes teaching visual. Mind mapping that can help learners to think, learn and remember effectively, is an innovative divergent thinking, simple and effective thinking mode. With such mind maps, teachers can help students to quickly understand a primary knowledge of course content, the hierarchical structure and the logical relationship between the knowledge points which can improving understanding of the course and continuous learning.

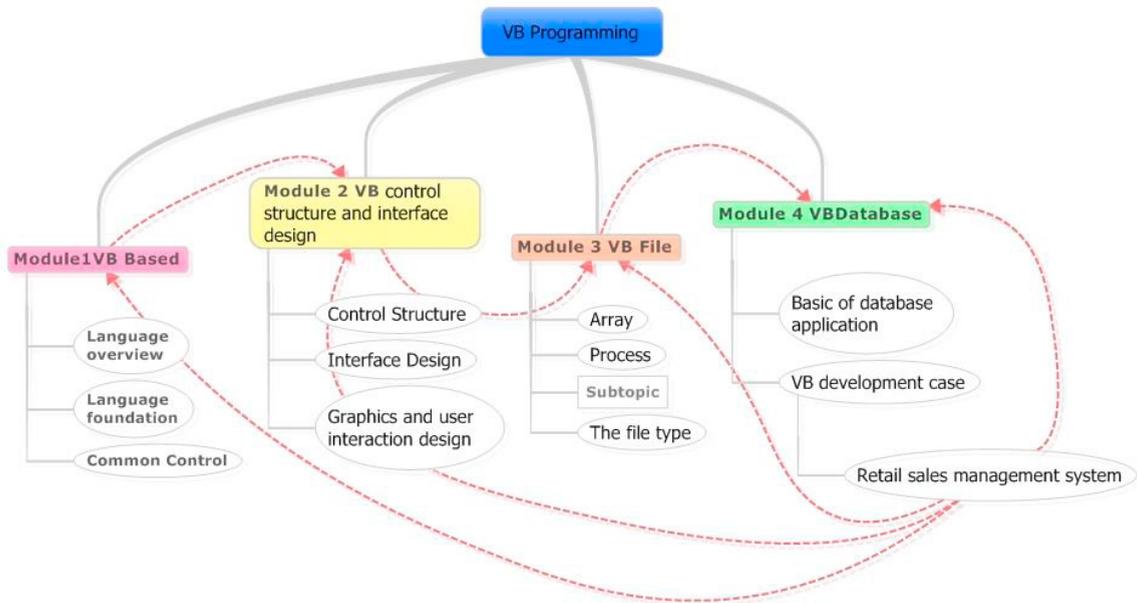


Fig. 1. Knowledge Structure of VB Programming Language Course.

### 3.2. Application of mind mapping in design theory course teaching

Mind mapping with a graphical visualization of teaching material and a teaching material knowledge structure characteristics can enhance the brain for knowledge 'desire'. It can help motivate students' brain function and activate the whole brain actively participate in learning, by the way can also enhance memory effect. The grammar content of computer programming language course is the difficulty and the key point lying in computer programming language. While this part is abstract and boring, we can use mind mapping method to obscure abstract theory with a simple mind map to clearly describe the algorithm of programming language, variety of grammar, structure and usage. This method can not only make it easy for students to understand the overall structure of the grammar; it also can deepen the memory. It helps students to understand and grasp the logic relationship between syntax and grammar. Fig. 2 shows a mind mapping designed according to VB control structure theory in computer VB programming language course.

With the guidance of the mind mapping in Fig. 2, the abstract theoretical knowledge content can be concluded and summarized and displayed visually. The students' theory learning ability are strengthened. This can not only enhance students' memory, make program structure and syntax structure clear, it also can exercise the student extrapolate, and live embraces the application ability. The students can learn the real programming thought and the programming method, accurate knowledge to learn. They can easily sort out the thinking of learning content which accelerates the students' knowledge internalization. It can improve the students' learning efficiency.

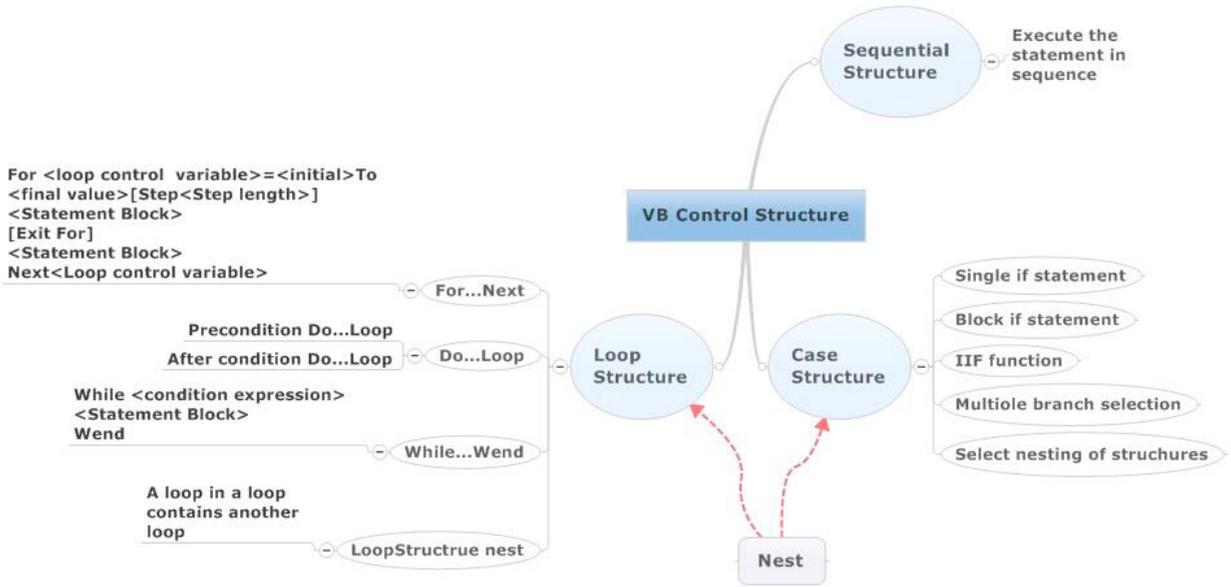


Fig. 2. VB Control Structure with the Guidance of the Mind Mapping.

### 3.3. Mind mapping optimizes curriculum practice teaching, trains software engineering ideas

Computer programming language is a practical course, and it is also an essential part of training students' creative thinking and practical ability. The application of mind mapping in the curriculum practice of practice teaching of the course has practical significance. Based on the teaching content and teaching characteristics of computer programming language course, we take VB program design as an example. It is a teaching case using the method of mind mapping. The design progress is: Case analysis -> interface design -> coding implementation -> running and debugging -> saves and generates executable files. The above steps display the whole process of the VB case design in front of the students. It not only enables students to master the program design process, but strengthen the idea of software engineering. It plays a key role for students to learn computer language design and theory with practice. Fig. 3 shows the mind mapping which combines the contents of the course knowledge and applies the line drawing method.

The mind map teaching case design can not only enable students to master the steps and methods of the VB program design, but it strengthens the importance of the curriculum practice. At the same time, it transfers the abstract thinking into visual and decentralized teaching mode. This method can cultivate the students' innovative ability and practical ability to apply, and makes the students learn to comb project overall train of thought. It can plan the whole project process, making clear the goal and operation of each step. It makes the project's overall design and detailed design and so on. The method can also strengthen and cultivate the students' computer software engineering thinking visually.

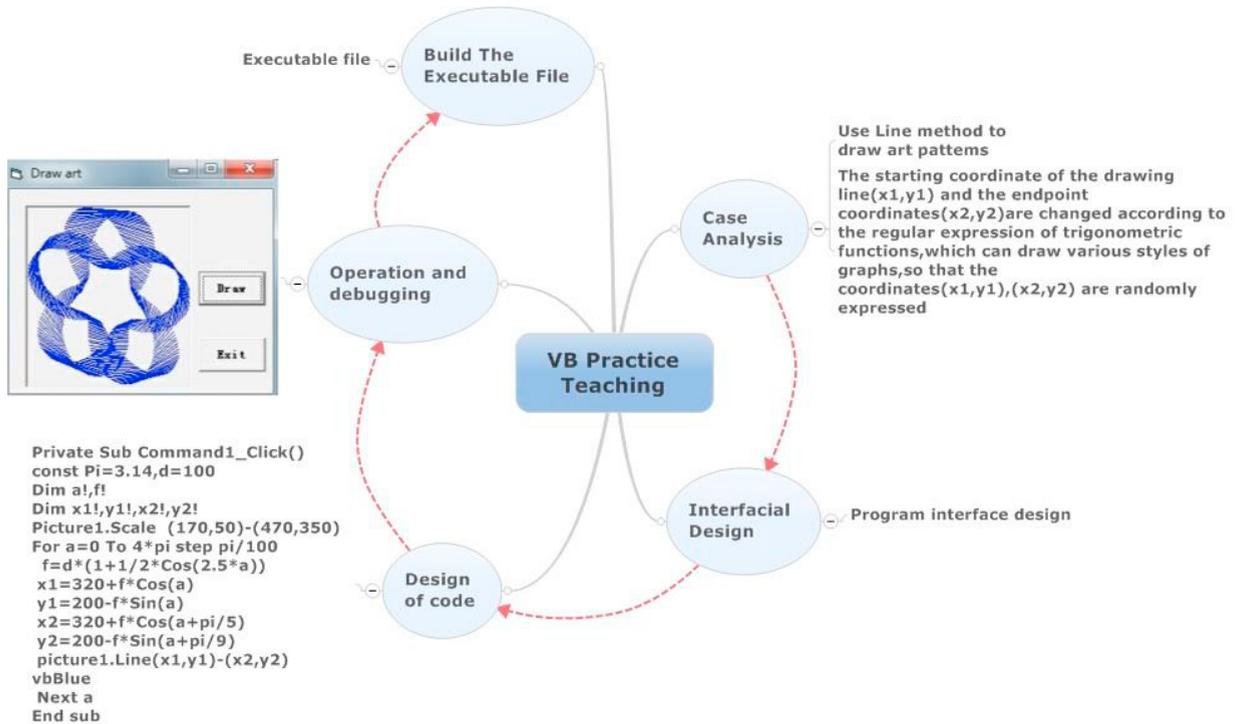


Fig. 3. VB Practice Teaching.

## 4. Conclusion

This paper shows that mind mapping can play an important role in college computer program language course with many examples. Mind mapping with the method of logic reasoning dynamically displays the process of knowledge generation and optimizes teaching and learning methods. As an auxiliary teaching method, the application mind mapping in education in China is still in the stage of research. Mind mapping is not a universal method of teaching; it should also be combined with other teaching methods, such as micro class, class, flip mixtures, and other classroom teaching methods, to improve the teaching quality and teaching effect. The purpose of education teaching is not merely to help students to learn the knowledge itself, but it helps students learn and master the methods of lifelong learning through different ways.

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