Exploration and Practice of Matlab Course in Undergraduate Student of Science and Technology

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Abstract: In order to improve the teaching quality of MATLAB course, this paper expounds the necessity for teaching MATLAB course in undergrade students of science and technology, and specially analyses the problems faced by the junior grade students when they are studying. Through the exploration and practice of MATALAB course teaching, this paper probes into the structure of course content, teaching content and teaching mode, and points out the concrete measures to teach MATLAB course in the junior students ofundergraduate.

1. Necessity of MATLAB Course in Undergraduate Students

MATLAB is a large-scale comprehensive software for scientific and engineering computing that integrates numerical calculation, symbolic calculation and visualization developed by MathWorks of the United States. It has a friendly working platform and programming environment, a simple and easy to use programming language, a strong scientific computing data processing capability, a color graphics processing function, a widely used module collection toolbox, and a practical program interface and platform, which are widely used in all walks of life. Because MATLAB is suitable for multi-subject and multi-work platform, it has the characteristics of powerful function, friendly interface, natural language and strong openness, it is recognized as accurate and reliable scientific standard software in international academic circle [1,2,3]. In the early 1990s, MATLAB became the preferred software for science majors in American, British, Canadian and Australian universities. In the design research unit and industrial department, MATLAB is considered as the first choice software tool for efficient research and development. Such as National Instruments'signal measurement and analysis software LABview, Cadence's signal and communication analysis and design software SPW, etc., are directly built on the MATLAB or supported by MATLAB[4]. In American and European universities, advanced courses such as linear algebra, numerical analysis, mathematical statistics, optimization methods, digital signal processing, electro-technical and electronic technology, modelling and dynamic system simulation all take MATLAB as a basic teaching content. At present, among the non-computer majors in science and engineering colleges in developed countries, the most popular programming languages are not C, BASIC, FORTRAN, but MATLAB. In our country, only master, doctor and some scientific researchers use MATLAB language at present, but the students of this specialty use less, most students have not used MATLAB [5]. Therefore, it is of great significance and function to popularize and apply MATLAB software to college students of science and technology in our

country to improve learning efficiency, speed up learning progress, save a lot of valuable time to use in understanding and applying the basic concept of new knowledge, and give full play to the potential of college students [6,7].

In view of its powerful functions, extensive application background and practicality in science and engineering, MATLAB has been favored by engineers and technicians, experts and scholars since its release, and many colleges and universities have opened MATLAB courses. In this context, our university has set up the MATLAB course in the junior students of science and engineering specialty, and is integrating MATLAB into the relevant professional teaching[6]. The purpose is to focus on cultivating students' modeling and computing abilities. It is expected that through learning MATLAB, students can use MATLAB language to calculate, analyze and solve general engineering and technical problems, and lay a solid foundation for future work in this major. However, due to the unique characteristics of MATLAB itself and the difference of students' learning software courses, it is necessary to carry out some beneficial exploration in the course content structure, teaching content, teaching mode and other aspects. Now we are communicating with you on the problems faced by the opening of MATLAB courses in junior students and the implementation measures.

2. Problems Faced by MATLAB for Undergraduate students

At present, there are few colleges and universities specialized in the course of MATLAB, most of which only integrate the course into some professional courses, and set up MATLAB as a solution to some specific problems of relevant specialities.This phenomenon is especially prominent in engineering[2]. In science specialty, it is common to apply MATLAB to relevant mathematics courses. When students first contact scientific calculation, they will think it is difficult and they do not have a solid grasp of knowledge points, which is mainly reflected in the limited learning of the course. But the main problem is that students can only solve some simple problems by calling related commands or functions through the limited study of the course, and have no or little MATLAB programming ability. Some of the slightly difficult problems encountered in reality are weak. On the other hand, there are few colleges and universities in the junior grades that offer MATLAB courses.

The students with single knowledge structure only have some fundamental concept of calculus and lack the ability of programming. From the psychological point of view, the assimilation ability of the students'original knowledge structure in this course is weak, if it is handled improperly, it reduces the meaningful learning, increases the frustration, weakens the students'active thinking activity of subjective participation, even produces the resistance emotion, and has a negative influence on the follow-up course. On the other hand, the lower-grade students'ability of self-examination, self-evaluation and self-study is poor, which creates an inexplicable mystery to the program, and can't correctly realize that their short-term study can design the program and control MATLAB software to solve some problems in this field. These all undoubtedly bring the challenge to the teaching of MATLAB software with huge computing function and wide application field[8,9].

What should we teach about the huge content of MATLAB? Has been plaguing the vast number of teaching people? The teaching content has not been in line with the professional knowledge, which has been puzzling the majority of teachers.There are many kinds of books in MATLAB at home and abroad.These books are divided into two kinds: one is to introduce the application of the toolbox as the main content, especially the calling of the internal commands and functions of MATLAB, which is introduced as a package; the other is to introduce the structure and method of the program design. Although the former overcomes the shortcomings of traditional mathematics teaching, such as abstract content, inaccurate manual drawing and non-intuitive, difficult to expand the teaching content, it ignores the teaching of mathematics classic knowledge and mathematical beauty. The latter involves the data structure and the idea of program design, and some mathematics contents and methods that students have not studied yet. Introducing these contents into the

teaching of MATLAB in the lower grade, it is easy to produce two extremes: the application of teaching toolbox only causes the students to lose their interest in learning because of the monotony of the contents and the simple invocation of the contents, and it is also easy to win the subject and dilute the students'learning of the classical knowledge of mathematics. With programming as the main thread, the students who have just come into contact with the thought and method of higher mathematics can learn the mathematical software.

3. Exploration and Practice in Teaching

For the knowledge structure of the junior students and the particularity of MATLAB software, students will have the feeling that they can read books and learn, but often encounter a lot of problems in the process of practice, sometimes they cannot continue the operation. The main reason of this phenomenon is that the learning of mathematical software is practical. Mathematical software in the process of learning and practice involved in the details of the operation is often very many, if ignore or misoperate one of the details, will cause learning obstacles, even learning interruption. According to the characteristics of Matlab series courses and the ability of junior students to learn computer software, in the teaching of this course, we use the sense of achievement to stimulate students'learning desire, so that students can solve some practical problems in each study, gain the sense of achievement, and thus stimulate their learning interest. According to the standard of curriculum construction, a series of exploration and practice have been carried out on the structure of curriculum content and the organization of teaching content, teaching methods and means and examination methods.

In the design of course content structure, we take task analysis as the basis, take task as the main line, take action as the theme, deal with the relationship between explicit knowledge and tacit knowledge, necessary knowledge and expanding knowledge, theoretical knowledge and practical knowledge through simplification and exemplification. The whole teaching is in accordance with "task proposal---obvious knowledge, necessary knowledge and theoretical knowledge needed to complete a task→problems that may arise in the process of completion and countermeasures→task or group completion independently→new task proposal". This requires that teachers should be teaching "curriculum", not teaching "textbook", teachers from "lecturer" to "instructor", so that students have more time to go deep into practical activities, so that students get initial training and greater understanding, their creative consciousness and ability to play an infinite space, so that they understand "the purpose of computing is its connotation, not the number", as the students say, "teachers speak more, better is limited, and we are infinite."

Adjusting the teaching content to consider the students'characteristics in due time, taking into account the students'psychological characteristics, knowledge structure and students'individuality differences, one problem encountered in the course of software design in the lower grades is whether to start from the grammar rules or from the specific problems. We start with the concrete problem, raise the question, draw out the relevant grammar rules, then explain the function of the sentence or function through a lot of examples, understand the grammar and syntax requirements in it, finally summarize some conclusions, explain the usage rules. In this way, students can see, feel, train of thought, learn to use, in the use of the meaning and use of the relevant sentence. Naturally understand and remember rules by reading and writing programs. For those unimportant rules do not need to be detailed, students can use it when looking at the instructions. Therefore, the teaching of Matlab software course focuses on the methodology of algorithm and programming. Taking the main algorithm as a clue, the paper introduces the practical background of the algorithm and its wide application in real life to the students, and combines the solution of mathematical software to make the students understand the application of Matlab software, so that the teaching content of

mathematical software is diversified and applicable, and the students'interest in the course is gradually increased.

To change the teaching method to apply image thinking effectively in the teaching method, to fully apply intelligence by introducing some practical problems and according to their differentiated knowledge structure, to guide students to change their thinking as soon as possible, so that classroom teaching is enlightening. The best method of language is example, and Matlab itself is "live", no problem is only one solution, through example, encourage students to give full play to their intelligence, encourage students to surpass teachers, enlighten students through their own programming practice analysis to compare different algorithms, summarize their positive and negative experience, improve their programming ability. At the same time, according to the difficulty of the task, the difficulty coefficient of each task is set in advance, so that the students at different levels can do something, so that the students know their acceptance ability in advance, so as to make further study plan.

4. Conclusion

As the saying goes, a man has two treasures, two hands and a brain. I've heard it, I forget it, I've seen it, I remember it, I've done it, I understand it. I think it's very image and appropriate. In view of the problems existing in the teaching of mathematical software, we should fully reflect the characteristics of the software, consider the students' knowledge background and development direction, both theoretical teaching and practical operation are required. By mobilizing students' learning enthusiasm and initiative, cultivating students' ability to solve practical problems, which can achieve the purpose of training application-oriented talents, and ultimately significantly improve students' ability to apply knowledge and comprehensive quality, to meet students' continuing study or social needs. Of course, problems are always unavoidable. Only by constantly reflecting on teaching and continuing teaching exploration and reform can we further improve the teaching effect.

Acknowledgements

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