

# Research on the Display of Matlab Mathematical Modeling to Higher Vocational College Students' Quality Improvement

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**Keywords:** Matlab, Mathematical modeling, Higher vocational students, Quality improvement

**Abstract:** In recent years, MATLAB mathematical modeling competition has been more and more popular among college students, and various MATLAB mathematical modeling activities have been carried out in various higher vocational colleges with MATLAB mathematical modeling competition as the carrier. MATLAB mathematical modeling is a link linking mathematics and life, and is also a bright spot in higher vocational mathematics education. Cultivating students' mathematical modeling ability of MATLAB can not only cultivate students' comprehensive ability, improve students' mathematical literacy, but also stimulate students' learning enthusiasm. Starting from the main functions and easy learning characteristics of MATLAB software, this paper expounds the importance of MATLAB software, and explains the necessity and possibility for higher vocational students to master MATLAB and the significance of learning this software well for mathematical modeling of higher vocational MATLAB.

## 1. Introduction

Higher vocational education trains highly skilled and applied talents. Higher vocational mathematics, as a basic course, aims to “be necessary and sufficient” and strengthen its application [1]. The high-end skilled talents trained by higher vocational education should not only be front-line operators, but also be the backbone of Chinese future industrial workers. They are the application of Chinese new technologies, inventions and processes in the future and can lead Chinese future technological innovation. MATLAB mathematical modeling is to make some necessary simplifications and assumptions for the prototype in reality and for a specific purpose, and obtain a mathematical structure by using appropriate mathematical tools. The “Matrix Laboratory”(MATLAB) software package introduced by Mathwork Company in 1967 is a good choice [2]. It is an interactive software package with strong functions, high efficiency and convenient for scientific and engineering calculations. MATLAB is a high-level language applied in the field of scientific calculation. Its generation is closely linked with mathematical calculation. Its main functions include numerical calculation, symbolic calculation, drawing, programming and application toolbox [3]. Under the current educational system and mode of higher vocational education, MATLAB mathematical modeling can be used as a starting point, an important means and an excellent carrier to improve the comprehensive quality and innovation ability of higher vocational students.

## 2. Connotation of Matlab Mathematical Modeling

MATLAB mathematical modeling is a process of abstracting, simplifying, determining variables and parameters of practical problems, applying certain laws to establish mathematical problems between variables and parameters, solving the mathematical problems, explaining and verifying the obtained solutions, thus determining whether it can be used to solve the problems in multiple cycles and deepening. Abstracting and simplifying the realistic model into a certain mathematical structure is the basic feature of the mathematical model. It can either explain the realistic state of specific

phenomena or predict the future state of objects [4]. It is an important way to inspire innovative consciousness and thinking, train innovative ability and cultivate high-level talents. It is also a powerful measure to stimulate students' desire and cultivate the spirit of active exploration, hard work, enterprising study style and unity and cooperation [5]. Starting with the analysis of real cases in life, the solution is not fixed, and students' various ideas are especially important here. The steps of MATLAB mathematical modeling can be roughly divided into: model preparation, model assumption, model composition, model solution, model analysis, model verification and model application. Of course, not all problems are modeled through these steps, and sometimes the boundaries between the steps are not so clear.

### **3. Matlab Features**

#### **3.1 The User is Convenient to Use**

MATLAB language is a language for interpretation and execution (before it is compiled by special tools). It is flexible and convenient. Its debugging program has rich means, fast debugging speed and less learning time. It solves the above problems and integrates editing, compilation, connection and execution. Do not deny each student's initial ideas, and encourage them to use their own ideas as a guide to determine the parameters they need to establish mathematical models. There is ample room for contestants to display their intelligence and creativity. In this process, students rely on the theoretical knowledge they have learned to solve problems, restore their consciousness, change their learning from passive to active, and stimulate their enthusiasm for learning. Hundreds of statements written in programming languages such as C/C++ and one statement in MATLAB can solve the problem. The program is highly reliable and easy to maintain, which can greatly improve the efficiency and level of solution [6].

#### **3.2 The Sentence is Simple and Rich in Connotation**

The most basic and important component in Matlab language is function, whose general form is  $[a, b, c \dots] = \text{fun}(d, e, f, \dots)$ , i.e. a function consists of function name, input variables  $d, e, f, \dots$ , and output variables  $a, b, c, \dots$ , the same function name  $f$ , different numbers of input variables (including no input variables) and different numbers of output variables, representing different meanings. This not only enriches the library functions of MATLAB, but also greatly reduces the required disk space, making the m files written by Matlab simple, short and efficient.

#### **3.3 High Programming Efficiency**

It is a high-level language for scientific and engineering calculation. It allows programming in mathematical form and is closer to our thinking mode of writing calculation formulas than languages such as Basic and C. Programming in MATLAB is like arranging formulas and solving problems on calculation paper. Under normal circumstances, it can be used to replace the underlying programming languages, such as C and C++. Under the same calculation requirements, the programming workload using MATLAB will be greatly reduced. It does not need to define the dimension of array, and gives matrix function and special library function of special matrix, which makes it appear very simple, efficient and convenient when solving problems in such fields as signal processing, modeling, system identification, control and optimization, which is incomparable to other high-level languages.

#### **3.4 Strong Drawing Function**

Matlab's drawing is very convenient. The graphics technology of MATLAB includes high-level drawing numbers of professional graphics of high-level such as two-dimensional and three-dimensional visualization, image processing, animation, etc. (for example, the illumination processing, chromaticity processing and four-dimensional data representation of graphics, etc.), and the definition includes some low-level drawing commands that allow users to flexibly control the network shape characteristics, and the graphical user interface can be created by using the handle graphics technology of MATLAB. It has a series of drawing functions (commands). When it is used,

only different drawing functions (commands) need to be called to mark the drawing title and XY axis on the drawing, and only corresponding commands need to be called for grid drawing. It's easy.

#### **4. Ways to Cultivate Vocational College Students' Quality and Ability by Matlab Mathematical Modeling**

##### **4.1 Train Students' Awareness of Matlab Mathematical Modeling**

The cultivation of students' modeling consciousness can introduce life problems that stimulate students' learning desire, stimulate students' interest and enthusiasm in the problems, and consciously inform students that they can solve such problems after learning the knowledge in this chapter. This requires the members to trust each other, learn from each other's strong points, cooperate with each other and cooperate with each other in a tacit manner. Each person's different ideas will naturally bring different solutions. It is valuable to be able to argue from their different opinions that the solution is the closest to perfection. The spark created by the ideas is the most precious wealth for students. In the process of modeling, students are mainly guided to learn and master correct and scientific learning methods, especially learning methods adapted to their own characteristics and the ability to acquire knowledge, and students are guided to learn the ability to acquire unknown knowledge with existing knowledge [7]. More guidance should be given to students to make full use of their spare time and to strengthen the cultivation of autonomous learning and self-education ability. You can directly enter MATLAB and my sentence on the command line, and the system will process them immediately to complete the whole process of compilation, linking and running. Using abundant library numbers to avoid complicated subprogram programming tasks, all unnecessary programming work is compressed.

##### **4.2 Through Case Analysis, Help Students Master Matlab Mathematical Modeling Methods and Steps**

Teachers set up specific cases according to the classroom teaching objectives and the needs of teaching activities, guide students to participate in analysis, discussion, expression and other activities, and master the MATLAB mathematical modeling methods and steps in the process of solving practical problems with the learned mathematical knowledge. Most schools have also set up relevant MATLAB mathematical modeling associations, in which teachers are responsible for competition guidance, and students actively cooperate with teachers to participate, thus making MATLAB mathematical modeling the most popular activity in schools. The MATLAB program cannot run without the MATLAB environment, which brings great inconvenience to its extensive development and use [8]. In order to improve the execution efficiency of programs and develop independent executable programs, a commonly used method is to call MATLAB with VC++. In the process of modeling, in addition to improving students' mathematical application ability, students' computer application ability, document retrieval ability and scientific writing ability are also enhanced. In the summary of thinking, it can help students to clarify the best thinking method for project completion and find their own professional theoretical deficiencies. In combination with the requirements of enterprises to facilitate the employment of students, the "MATLAB Mathematical Modeling" course is also carried out with all the students as the main body. Students' spare time is used for classroom teaching, and the assessment of whether ideas and theories are innovative is carried out. This fully mobilized the enthusiasm of the students and increased their confidence. Taking students as the main body, the teacher-guided teaching mode has improved the teaching efficiency, and students have also realized the interest in learning.

##### **4.3 Carry out Matlab Mathematical Modeling Activities to Cultivate Students' Independent Modeling Ability**

Due to many factors, students do not have enough time to think, analyze and discuss the mathematical model independently, nor do they have enough time to solve and verify the model in class. It is even more impossible to modify the model repeatedly after the verification of the

mathematical model fails. MATLAB plays an important role in this teaching process. Because MATLAB can use its internal interpolation function and limited data to generate enough data and draw corresponding graphs. It can operate flexibly on the same screen to quickly eliminate writing errors, grammar errors and even semantic errors in the input program, thus speeding up the speed of program writing, modification and debugging by users. It can be said that it is a simpler language than VB in the process of programming and debugging. Many higher vocational students have difficulty in completing basic writing. Most of the experimental reports have few words and can't tell the essential and important contents. They are copied from professional courses and graduation paper net, can't write effectively, and can't organize and express their views in effective languages. In the activity, let students think and implement modeling steps and solve problems independently with MATLAB mathematical modeling thinking method on a certain problem, which is not only a beneficial supplement to classroom modeling, can let students further understand MATLAB mathematical modeling, but also can give full play to students' subjective initiative and cultivate students' independent modeling ability. Combined with the application example of MATLAB mathematical modeling, considering students' own ability, actively encourage and guide students to participate in various innovation and entrepreneurship competitions, so as to achieve the purpose of effectively enhancing students' innovation consciousness and creativity.

#### **4.4 Assigning Matlab Mathematical Modeling Homework to Cultivate Students' Habit of Solving Problems with Matlab Mathematical Modeling**

On the premise of mastering the basic methods and steps of MATLAB mathematical modeling, students can return to life and collect the original data and data in life as the basic information in the mathematical model. The authenticity and reliability of the information provide the necessary guarantee for the correctness of the model results. After giving practical problems, students are encouraged to think boldly, discuss with each other, and propose solutions from different angles. In the discussion, we can find out each other's shortcomings, thus reestablishing a more perfect solution to the problems and creating a harmonious, democratic and free teaching atmosphere. MATLAB plays a key role in solving the model. Therefore, combining Matlab to carry out MATLAB mathematical modeling teaching will achieve twice the result with half the effort. Due to the powerful mathematical function of MATLAB. It is possible to use either continuous or discrete methods. For example, if the degradation of image quality is caused by the addition of background noise patterns, the difference between the two images can be better restored as long as the background patterns are known. Let students quickly improve their comprehensive ability through competitions, break the traditional classroom teaching mode, let more and more students give full play to what they have learned in competitions, and make them realize the application value of MATLAB mathematical modeling in life. The team spirit of brainstorming and learning from each other can be good at listening to other people's opinions and can synthesize the best scheme from the discussion of different viewpoints. This cooperative collectivism spirit is very much needed by students in their future work and life.

## **5. Conclusion**

Education in the 21st century must put the cultivation of students' innovative consciousness in the first place. For the sake of students' employment, schools should strongly adhere to the education mode with students' innovative ability as the main body. MATLAB mathematical modeling is not only an outbreak of knowledge, but also a textual research of perseverance. MATLAB has become the most popular software tool for scientific and engineering computation in the world. It has become a brand-new high-level computer programming language with wide application prospects. Some people call it the "fourth generation" computer language, and its language functions are becoming more and more powerful. Combining MATLAB to carry out MATLAB mathematical modeling teaching can greatly improve students' enthusiasm in learning MATLAB mathematical modeling, effectively solve the disconnection between theoretical teaching and applied mathematical software, and greatly improve teaching quality and teaching effect.

Therefore, it is important and necessary to combine MATLAB to carry out MATLAB mathematical modeling teaching.

### **Acknowledgement**

The authors acknowledge the Education and scientific research project fund for Project of Humanities and social sciences of the Ministry of education of China (17YJA880070\17YJA880049), graduate education reform project of Jimei University (YJG0812).

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