BioTechnology

An Indian Journal

With concise remarks on the establishment and application of the mathematical model in the curriculum system of advanced mathematics courses

Yuxia Wang
Zibo Vocational Institute, Zibo 255314, (CHINA)

ABSTRACT

As to the classroom teaching of advanced mathematics, the establishment of mathematical models and application of teaching cases have a positive effect to stimulate student interest in classroom learning, while laying the foundation for appropriate linkages between disciplines. This paper made the further planning on teaching ideas of advanced mathematics "model" by the application of mathematical models, while giving more precise finishing to the principle of application. The teaching concept of advanced mathematics in traditional college can be a positive change, while the application of mathematical models of "effectiveness" has further excavation, thus changing the education thought in traditional university, which can provide practical and necessary foundation for the reform and development of advanced mathematics.

KEYWORDS

© **Trade Science Inc.**

INTRODUCTION

In the process of teaching reform of the advanced mathematics in contemporary college, the center is the fully tapped of the "science" during the building process of the knowledge. The next is the continually exploration of the "practicality" knowledge, and the deep exploration of the fun and the scientific of teaching. It can enhance the development value of advanced mathematics knowledge; provide an important basis for positive change in the way which people thought, and be fully avoided the traditional disadvantages of advanced mathematics presence.

In advanced mathematics teaching, the core values of the establishment and application of the mathematical model is the scientific guide of thinking ability and way of thinking for students, and fully develop to spatial thinking on the basis of the establishment of the model, which can reach the ultimate goal that advanced mathematics take positive training in teaching ability for students. In this paper, the in-depth exploration of the fundamental deficiencies of traditional advanced mathematics teaching was made, while making the summarization of the inhibition that thinking ability of students generated by traditional teaching and exploring the "superficial" phenomenon of the teaching content in curriculum system, which reflected the importance of the construction of the "practicality ". By the effective establishment and practice of mathematical models, the fully explanation of the change of the basis thinking ability of students was made, and the level of understanding of advanced mathematics for the high school students was sufficiently improved. The principles of application of the model of teaching ideas used in advanced mathematics teaching was comprehensive inducted, making the "model" of teaching ideas on students' ability of "targeted" continues to strengthen. The full study that combined with the positive impact of the teaching model plug on the mathematical model can promote a more persuasive of the establishment of the model of advanced mathematics teaching. The application value of the "model" of teaching ideas was continues improved, which can meet the inevitable demand of higher mathematics teaching in the future development.

INEVITABLE DEFICIENCIES OF ADVANCED MATHEMATICS IN TRADITIONAL EDUCATION

Theoretical concepts and definitions introduction become the subject of advanced mathematics teaching

Theoretical concept teaching is the fundamental of the formation of mathematics thinking in college and the key to formatted students' ability to understand advanced mathematics. The theoretical concepts and definitions introduction should follow the practical needs of curriculum development, and cannot become the subject of advanced mathematics teaching. In advanced mathematics teaching thought of traditional students, the understanding of the process in this regard should be further improved. The teaching concept of traditional advanced mathematics continue strengthen the basic theory making the curriculum system construction in a "superficial" teaching phenomenon, which produce the corresponding suppression of the application and the extends of theoretical knowledge of the advanced mathematics, so that the advanced mathematics courses did not reflect the teaching characteristic of the fully train of space thinking for students[1]. This is the main shortcomings of the traditional university teaching in advanced mathematics, but also the important inhibiting factors of the development and training of the understand ability and innovation capacity of students. Also it will produce a corresponding negative effect to the path of sustainable development of the advanced mathematics teaching.

The process about practicality knowledge is less and the value of knowledge is difficult to reflect

The "practicality" knowledge has irreplaceable value in advanced mathematics teaching, but also has a positive role in promoting students' ability to apply. Throughout the process of advanced

mathematics teaching, the explanation and demonstration of theoretical knowledge is increasing, the integration of "practicality" knowledge is extremely rare, resulting in the corresponding "cope" thought when students faced the advanced mathematics teaching. The value of advanced mathematics knowledge does not adequately reflect which will have negative effect in the guidance and rational thinking for students. This is not the direction of the future development of university mathematics teaching today, nor is the ultimate goal of advanced mathematics talent cultivation, making serious deficiencies of the process of knowledge building; "science" of course structure and system construction is difficult to show. Ultimately not fully tapped the application ability and cultivate potential for students of advanced mathematics, which lead the gradually decreased of practical value of curriculum system.

Ingrained idea of "mathematics useless"

As to the advanced mathematics teaching in traditional universities, many teachers still think that social value of advanced mathematics teaching is not high, many students are not able to effective apply the advanced mathematics. This is resulting in the more extreme emotions between the students' learning process and teachers' teaching process. It can make positive qualitative changes in the teaching process, and the essence of teaching gradually changed from "model" teaching to "formalized" teaching. This teaching idea has some negative consequences to advanced mathematics teaching, but also means hindering factors increasing in the development of advanced mathematics, which affect the ultimate goal of advanced mathematics teaching personnel training[2]. From the long-term development perspective, "mathematical useless" teaching thinking has produced a corresponding resistance to advanced mathematics "usefulness" of the inquiry, but the changing of this view is the important part of college mathematics teaching, which put forward higher requirements of the development of advanced mathematics times.

APPLICATION OF MATHEMATICAL MODELS IN ADVANCED MATHEMATICS TEACHING

Improve the ability of students to apply their knowledge through the establishment of mathematical models

Reform of advanced mathematics teaching philosophy has been in the imminent state and the cultivation of students' ability to apply their knowledge is extremely urgent. As to the teaching system, the reform of advanced mathematics teaching system is difficult to "comprehensive" reform, for which only start from the micro, takes the partial reform as a starting point, which is an important part can be optimized of advanced mathematics teaching system. As to the traditional understanding of advanced mathematics of college students, making the stimulate students' interest in learning as a priority can make the adequate training for the ability to apply their knowledge and awareness, thus achieving purpose that continue to strengthen the "practicality" of advanced mathematics teaching, allows college students produce a correct understanding process of the knowledge of advanced mathematics, and then formed the application process of the understanding[3]. In teaching, beyond the effectively penetrate basic concepts, definitions, theorems and methods, the relevant mathematical models can make into advanced mathematics teaching to form a classic teaching case, which making the teaching process can reflect certain "interesting "feature. Thus it can make the learning ability of students growing based on the original, explore awareness and ways of thinking can have positive change, which can achieve fundamental requirement that advanced mathematics "model" teaching on ability.

Case 1: When teaching the zero existence theorem of continuous function on a closed interval, teachers usually simply list more common application cases with zero theorems. In the process of establishing a mathematical model, teachers can raise some very different problems to students, such as how to lay flat a long rectangular chair legs on uneven ground. Such problems seem to be more common, while first feeling of students is not, because this problem exists the larger necessarily link

with real life, students can stimulate a certain extent to their own interest. However, this problem cannot make the students linked the advanced mathematics teaching content together immediately, the related experiments should made to conclude, for which exploration the psychological of students can be mobilize. Through experimental demonstration, the results simply chair rotates around its plane at an angle, the chair will magically put steady. How mathematical knowledge can used to explain it. The following illustration and explanation will be able to draw the appropriate conclusions.

(1)Under some reasonable assumptions, the plane of the chair in a coordinate system was shown in Figure 1; then the rotational position of the chair is completely determined by the angle θ.

(2)Set $f(\theta)$ as the sum of distance between A, D and the ground, Set $g(\theta)$ as the sum of distance between B, C and the ground, then $f(\theta)$ and $g(\theta)$ both are continuous functions. Because at least three legs are on the ground in any position, so that $f(\theta) = 0$ or $g(\theta) = 0$ was establishment.
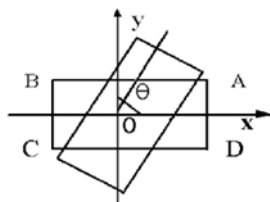

Figure 1 : Placed schematic of chairs

(3)Set $h(0) = f(0) - g(0) > 0$, then the $h(0)$ is the continuous function on $[0, \pi]$. If $f(0) > 0$ and $g(0) = 0$, then $h(0) = f(0) - g(0) > 0$. Making the chair rotated π around the center counterclockwise, known by symmetry, it turned out $f(\pi) = 0, g(\pi) > 0$. Then it turned out $h(\pi) = f(\pi) - g(\pi) < 0$. Finally, by the zero existence theorem, there must be $\theta \in (0, \pi)$ that make $h(\theta) = 0$ or $f(\theta) = g(\theta) = 0$. So, the chair would stay steady when it was on the θ.

Such mathematics teaching cases are more practical, which can often encounter in the usual everyday life. This kind of problem was seemed unrelated between advanced mathematics, but such problem was able to solve scientific through effective mathematical model. It can obviously stimulate interest of students in learning when face this kind of problem. Also the "practical value" of advanced mathematics teaching has been improved.

Case 2: After listing an indefinite integral teaching cases, teachers should list more integrated teaching cases for students, so that students can actively expanding knowledge in the teaching of mathematical model establishment. It allows students to carry out longitudinally extending of the model, which can have effective training of thinking for students[4]. For example, the United States made the nuclear waste packaged in lead-bucket and then sank into the sea. If the water is deep and undersea rock was hard, then the barrel would crash when it reached the seabed with large speed. How to demonstrate their safety? Such teaching examples are relatively new, and participate interest of students themselves will continue to improve. This problem can be directly converted into the equations of motion of a falling body damping, find it eventually speed when reached the seafloor. But it was not yet talking about differential equations, so it deliberately presented as a comprehensive examination for students with calculus knowledge.

1) First, let students clearly independent realizing that this problem is a falling body movement, while not well-known free fall learned in secondary school. It was the damping falling body movement. How to reveal its law of motion is a new problem for students, which can easy to stimulate their desire to explore.

(2) Using the physical meaning of the derivative and Newton's second law of motion to establish the equation of motion:

$$\begin{cases} m\dfrac{dv}{dt} = mg - kv \\ v(0) = 0 \end{cases}$$

Where k is the air damping, and tells them this is a new equation: Ordinary Differential Equations.

(3) Using the learned calculus knowledge to solve equations: the equation deformed to $\dfrac{dv}{g - \alpha_v} = dt$, where $\alpha = \dfrac{k}{m}$, Then according to the invariance of the first order differential form, both sides were made indefinite integral, which draw $f\dfrac{dv}{g - \alpha_v} fdt + c_1$, the answer was $v(t) = \dfrac{mg}{k}(1 - e^{-\frac{k}{m}t}) \in (0, +\infty)$. So we can get the velocity function.

(4)The issue reached here is far from over, which can guide students to recognize two realities: (a) when $t \to +\infty, v(t) \to \dfrac{mg}{k}$ (constant), which indicating that the final damping falling body movement tends to a constant speed. Setting $k \to v$, $v(t) = gt$ can draw by the limit process, just as familiar free fall. So that students recognize the special role of advanced mathematics tool in solving variable movement.

(5) Because it is difficult to determine the seabed objects fall time t , so the final set speed v will be difficult draw by t . So the actual derivation can be converted to solve the problem through a simple ingenious composite function: $m\dfrac{dv}{dt} = mg - kv$, $m\dfrac{dv}{dh}\dfrac{db}{dt} = mg - kv$. Because $\dfrac{db}{dt} = v$, so $mv\dfrac{dv}{dh} = mg - kv$ was established. Transforming $v(t)$ into $v(h)$, $v + \dfrac{mg}{k}\ln(g + \dfrac{k}{m}v) = -\dfrac{k}{m}h + \dfrac{mg}{k}\ln g$, as the depth of the ocean h was known, then the v can be draw.

It is difficult to make related analysis from the above algebraic equations, which seems that it was mutual breach between the previous solutions of exercises. But from another perspective, it can make better training for students when solving the problem in a way of thinking. Thus the solution of practical problems can effectively optimize so that advanced mathematics can be widely used in solving practical problems. Refining the solution to the particular problems can enable students to form a problem-solving experience and encourage students can make reasonable use of the mathematical model when faced the real problems[5]. This is an important symbol what students from elementary mathematics forward to advanced mathematics, but it also means advanced mathematics will trivial mathematical knowledge of organic integration to achieve a qualitative leap in advanced mathematics teaching. This is an important means for teaching students to effectively stimulate interest in learning, while the advanced mathematics "practicality" can improve steadily.

Improve the interest of the establishment of the mathematical model links between subjects

By selecting and explaining the teaching case to fully appreciate the linkages between the disciplines can effectively excited the enthusiasm of students, making compactness between disciplines continue to strengthen, making the interesting of the process of advanced mathematics teaching rising. From the "applicability" feature in the establishment of the advanced mathematical model, physics knowledge can make full use of the advanced mathematical model. Students can take the mutual integration of advanced mathematics and physics knowledge, which ultimately achieve mutual development that led to the discipline of advanced mathematics science curriculum system building, laying a solid foundation for advanced mathematics teaching widen the road of development, through the following cases will be able to draw such a conclusion.

        Case 3: In advanced mathematics teaching, teachers can make physical discipline fun games closely related into teaching when teaching infinite series of convergence and divergence discrimination. Taking template-stacking model diagram as an example, putting the same size planks stacked together (see Figure 2), and asked whether the right end of the piece of wood on the top of the woodpile can toward infinity while the woodpile toward does not fall.
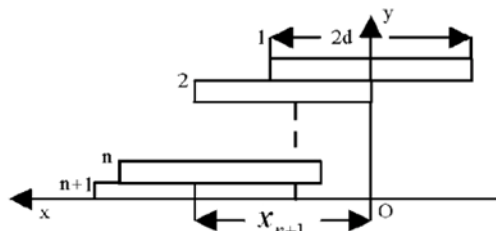

Figure 2 : Model diagram of stacked planks

        On the surface, it is difficult to do this. By the physical knowledge to build a mathematical model to take the in-depth reflection on the process of establishing the coordinate system, under the assumption that the abscissa of the center of gravity of the n block of woodblock from top to bottom is x, if keep the wood heap does not fall, there are recursive relationship:

$$\begin{cases} x1 = 0 \\ x_{n+1} \dfrac{(x_n + d) \times 1 + x_n \times n}{n+1} \end{cases}$$

        Then it can draw that $x_{n+1} = d\sum\limits_{k=1}^{\infty}\dfrac{1}{k+1}$. While the right side was harmonic progression, which diverges to infinity, then come to an affirmative answer. This mathematical model sets simple physics game as the fundamental starting point, so it can the reasoning the application process related to the mathematical knowledge. It needs for clever transformation, making the classroom atmosphere can get better sublimation in the original basis, make more extensive use of advanced mathematical knowledge, which can illustrate that the mathematical model can play a positive role in advanced mathematics teaching reform.

THE APPLICATION PRINCIPLES OF MODEL TEACHING THINKING IN ADVANCED MATHEMATICS TEACHING

Outstanding the establishment of the mathematical model by setting usefulness in life as the fundamental

        The building thought of advanced mathematics teaching model should take the case in real life as a teaching science, take the real life as a starting point to effective stimulate student interest in learning, so that gradually narrow the gap between students and the mathematical model, thus achieving the unity of the teaching thought of "model" and learning thinking[6]. In this kind of process of teaching, students can change the traditional sense of learning when faced advanced mathematics classroom. Also it has a positive effect to space thinking for students, while continue to improve independent problem-solving skills, develop more targeted exploration of consciousness. It is the basis that the "model" of advanced mathematics teaching deep penetration, as well as provided solid ideological protection for the continuously importation of the "practicality" of the mathematical model building.

"Simplistic" of the model building process can help students fully understand

"Simplistic" can also be called a scientific optimization process, and it is not the content omitted of the model building from the surface, the key is to build step organic integration, making a more intuitive for mathematical model and reduce unnecessary steps and processes. This will generate positive impact for the rapid increase in the understand ability of students, as well as created a more intuitive expression of the process model, thus providing a good foundation to continue to strengthen for students to apply their knowledge and awareness of the ability. This is an important part of establishment of the "model" teaching ideas of advanced mathematics, and a necessary requirement to get efficient use mathematical model. It can not only improve the application efficiency of advanced mathematics teaching, but also help students with the flexibility to apply.

Improve students' understand ability by combining model establishment and textbook knowledge

The establishment of advanced mathematical model should take mathematical knowledge as the main body, gradually raise the level of elementary mathematics to advanced mathematics level, so that students can realize their own capabilities and development in the subconscious, making the mathematical model has a strong "scientific". This is the core ideas of the establishment of mathematical model and the effective application in advanced mathematics curriculum system, but also the key of penetrate deep of the "model" of teaching philosophy about majority of teachers[7]. Taking practical problems as the fundamental starting point, taking in-depth exploration for the establishment of the mathematical model, so that students can gradually move from basic to complex, which can help students understand and continuously improve their capabilities.

The explain process of model should be fine processing

The explain process of the establishment of model is the fundamental understanding process of mathematical model for students. So it should take the explain process as the main foundations of mathematics, which gradually penetrate to the advanced mathematics knowledge. Among this, the language should be constantly optimized, and the transmission process will be fine processing which allows students from the language level to achieve a basic understanding of the model. From the point of model establishment, the starting point of its establishment should take deep dig, which allows students to fully understand. And ultimately makes the application of mathematical models in advanced mathematics teaching fully reflect and meet the fundamental needs of the development of students' thinking. This is also the "advanced" that "model" teaching ideas of advanced mathematics, which can realize the depth exploration of the "model" teaching ideas.

SIGNIFICANCE OF TEACHING MODEL PLUG IN ADVANCED MATHEMATICS TEACHING

The teaching plug of mathematical model is an important manifestation of the application of science and technology of advanced mathematics teaching, which can play an important role in the formation of students' way of thinking. Starting from an intuitive sense, teaching plugin of mathematical models can be effective for data analysis, modeling, design, and then play simulated generate role in building the model. In advanced mathematics teaching, teaching plugin of mathematical models can enable students more intuitive to understand the fundamental principles of model building, making the student's own imagination and thinking skills to get the corresponding excitation process, encourage students to mathematical thinking and spatial thinking fully expanded, which can provide the necessary security conditions for a smooth advanced mathematics teaching.

CONCLUSIONS

The establishment and application of mathematical models in advanced mathematics teaching can have a positive impact. As to the reform of discipline and perspective development, reasonable mathematical model can enable students to expand innovative thinking and spatial thinking, encourage

students to further improve the imagination and the ability of observe. From the academic development perspective, the process of building mathematical models can often linked the real life into teaching, so various disciplines can form close links, students learn by analogy, to provide a solid basis for the formation and training of exploring ability.

REFERENCES

[1] Sarina Zhao; The effectiveness to improve advanced mathematics teaching, Shanxi Finance and Economics University, **S4**, 206-206 **(2012)**.

[2] Jinwei Yang; Innovative talents training based on the innovative thinking of advanced mathematics, Education and Vocation, **26**, 132-133 **(2013)**.

[3] Guimei Zhang; Advanced mathematics teaching should focus on non-intelligence factors to students, Education Exploration, **4**, 66-67 **(2012)**.

[4] Jiakun Yang; Some thinking on the effectiveness of advanced mathematics teaching in vocational colleges, China Adult Education, **16**, 109-111 **(2012)**.

[5] Xiaomin Chen; Reflections on the reform of advanced mathematics teaching in higher vocational college, Vocational Education Forum, **9**, 64-66 **(2012)**.

[6] Xianlin Zeng; Reform investigates of advanced mathematics curriculum in vocational colleges, Chinese Vocational and Technical Education, **20**, 33-35 **(2012)**.

[7] Xuerun Zhang, Zhongdong Wang, Xianghong Xu; Analysis of implementation of research-based teaching in advanced mathematics teaching, Mathematics Education Journal, **21(1)**, 85-87 **(2012)**.