Some Opinions on the Textbook of Mathematical Analysis for Normal College Students

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Abstract. In this paper, for the essence and characteristic of normal university education, we give some opinions on editing the textbook of mathematical analysis for normal college students in our aspects. At first, the book should be structured by the complete basic knowledge of the system of mathematical analysis with its own logic in blocks, the completeness of knowledge for the textbook is a guidance to the students, which will help them to face some challenge when they are going to be a primary or middle school mathematics teachers later. The second, the book should display the creative points of mathematical analysis and motivate them to create from what they learn from the textbook. The third, the textbook should tell the students to apply what the learn from the textbook for practical problem. At last, the materials of mathematical analysis textbooks for normal college students should contain some introduction on one of the mathematical engineer software, which will help the students to learn easier and it will be helpful to enhance the students to apply mathematics to solve practical problem.

Keywords: mathematical analysis textbook, normal college students, creativity, guidance.

1. Introduction

As one of the basic subjects for the college students of mathematics department, Mathematical analysis is considered seriously. So, edition of the textbooks of mathematical analysis is also seriously taken account of. And the methods for teaching and learning about mathematical analysis are usually talked about by many mathematician who focus on mathematics high education. In contrast, the mathematical analysis textbook is not taken account too much, although there is some classical mathematical analysis textbook written by some well-known mathematician such as V.A. Zorich, W. Rudin, G. M. Fichtenholz and G. Pólya, even outstanding mathematician R. Courant and D. Hilbert [1-4]so on. Especially, there is too little focus on the mathematical analysis textbook for normal college students. In China, there is only one set of mathematical analysis textbooks edited by the department of mathematics of the East China Normal University [5], which is edited specially for normal college students. So, it is necessary and urgent to edit a set of textbooks of mathematical analysis for the normal college students.

Why the textbooks of mathematical analysis for normal college students should be different from those just for general college students from the department of mathematics? This is decided by the nature and goal of normal university. As we all know, the main goal of normal college is to cultivate the teachers for the primary and middle school. So, the textbooks for them should be designed to fit this requirement in different sense. At first, to the teachers for primary or middle school students, it is necessary for them to learn the subject widely, which will help them to catch more wide sight of this subject. The wider horizon in the major subject will help the future teachers to do better in their future teaching, meanwhile the depth of the knowledge for some subject is not necessary. Because the knowledge for the primary and middle school teacher is not mainly used to do research but just is used to help to be imparted clearly and accurately. The second, the background for the knowledge of the subject is very useful for the students to really grasp the subject. And the history of the branch of knowledge can show the reason why the subject come into and how it displays the mathematics thought of such subject. The idea contained in this subject is the kernel of itself and is the foundation of its application. So telling the original source of knowledge to the teachers will keep the teaching methods always being on the right way, which can help the students to know better where the

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knowledge come from and where they will be used. This will help the teacher to activate students thinking more and improve the students' ability of applying the knowledge. The third, since the textbooks are compiled for the future teachers, they are also needed to be designed to stimulate creativity, and help the future teacher to know how to design creative materials for their students in their mathematics teaching. At last, introducing one suitable mathematics applied software is also helpful for the normal college students to study mathematical analysis and beneficial for their future teaching work. According these, the textbooks for normal college students must be composed differently from those for other college students. Therefore, the following opinions should be considered when we compose the mathematical analysis textbooks for normal college students.

2. Completeness of the Textbook of Mathematical Analysis

Since the normal college students will generally become primary or middle school teachers, they need knowing the whole basic scope of the subject they study in some sense, the completeness of knowledge on this subject is helpful to lead them to teach in the right way in the future. We cannot imagine how a teacher can keep what he or she teaches is correct without full grasping the subject. This requires that the textbook for normal college students must be complete.

The first, the knowledge of this subject need to be complete. As system of mathematical analysis, it must contain the system of real number and its completeness, limitation, derivative, integral and series of numbers and functions. The completeness of real numbers is the basis of this subject, although the theory of real number is a little difficult comparing the other part of this subject, especially, as the learners meet it at the beginning of the study on this subject. Limitation is the key tool which is used to study the analysis property of function. To give the detail of limitation, the side limitation and infimum and supremum limit are also needed to be introduced in the textbook of mathematical analysis for the normal college. It is the starting point of analysis, and it is the most appropriate and useful tool to analyze both the macroscopic property and the microcosmic property of functions(relationships). The analysis properties of function including continuity, derivative and integral, are the kernel of mathematical analysis, any of them cannot be omitted. In application, the series of numbers and functions are also necessary, they are widely used in solving practical engineer problems. Sometimes some concepts are useful for the application later, but cannot be edited in the text, they can be arranged in the exercises to keep the completeness of this subject, such as up semi-continuous and low semi-continuous so on. Which will complete the subject in another aspect.

The second, the history of the subject, as one part of itself, must be listed in the textbook to help the reader to know the subject better [6]. The history of some subject includes not only the development of the knowledge itself but also the biography of the outstanding mathematician who contribute to the subject. The history of the development of this subject can help us to know when and how the knowledge stems from and its development background. To the students, the biography of mathematician can tell them who and why the branch come from, such as the history of calculus and the biographies of Isaac Newton, Gottfried Wilhelm Leibniz, Augustin Louis Cauchy and Bernhard Riemann so on, are very important part of the textbook of mathematical analysis.

The third, for the characters of mathematics, the completeness of mathematical analysis includes the content, skills and thoughts of mathematics. Besides the content, how to arrange the mathematical thoughts and skills in the textbook is also a kernel job for editing a mathematical analysis textbook. Catching the mathematical thought is the soul of studying mathematics in some sense, which can help the students to understand the content and know how to use the mathematics. The mathematical thoughts should be shown in the body of textbook, which will impress the reader deeper and is handy for the teacher to explain and introduce them to the college students. Sometimes for the restriction of the length for the body of textbook, the detail of the mathematical thoughts cannot be listed, then the additional reading materials for mathematical thoughts is necessary. They can be designed as reading attachments after the text body or addresses of website about these topics after exercise. Exercise is another key part of the textbook. High quality exercises are good complement for a textbook, which can measure the scope and depth of understanding the materials given. What's more, the suitable

exercises give the chance to the students for practice and application, and some useful material worthy of being discussed can also be added to the exercises part.

In a word, the completeness of the textbook for normal college students is more required than its depth in content, for the wide enough scope of a subject for the teachers will keep them not walking out the correct teaching trace. The right meaning of concept and definition can be only guaranteed when the teacher know the subject completely.

3. Creativity and Application Points in the Textbook of Mathematical Analysis

As we all know, creativity is the essence of any subject, so the textbook must list the creativity of the subject its own [7]. How to arrange the creativity points of mathematical analysis is one special character of the mathematical analysis textbook for normal college students. Firstly, we should display the creativity points of mathematical analysis in their right place, either it can be showed in the body of text or in reading materials. Creativity is one of motivations of study and application of this subject, which can lead the students to think the knowledge over more deeply and help them to grasp what they study better. Secondly, in the textbook of mathematical analysis for normal college students, necessary creative exercises are very important, on one hand, these exercises are useful practices for them to experience the creativity. On the other hand, the creative exercises are the models for the future teachers, which hint them what kind of style of creativity problems will be given to their students and how to design the creative exercises for their students. Thirdly, the creativity should follow the frontier of this subject. In any textbooks, We usually find that there are some creative exercises when they are listed originally, but they are outdated and even meaningless today. So the creative exercises must be relative with today's life and science even hint something for the future. In a word, the creativity is the soul of any subject.

Application is another center problem for any subject itself own [8-11], without application, the knowledge is just a game or only for a joke. As we all know, any science is derived from the practical application and is used to help people to solve real problem better in real life. So how to use the science of the subject is usually considered seriously when the textbook is edited. Initially calculus is created by Isaac Newton and Gottfried Wilhelm Leibniz just for some application. To the application of mathematical analysis in the textbook for normal college, the textbook should firstly tell the students what can be used to apply, where the mathematical analysis can be used and how to use them. Since the mathematical analysis is consisted of five parts: real number theory, limitation, differential, integral and series theory, the mathematical analysis textbook should let the students know what can be applied and they are applied for what in each part of them. Behind the application, the reason and the nature of the knowledge points in every part should be clearly listed in the textbook. For example, why the differential is one part of the content of the analysis? From the people's cognition of the world, we think that the real world is composed of the relations among each other, and how to treat the relationships between people, one method is to consider its variety, during the whole change process, change rate is the best way to describe it, so derivative becomes the most required tool for the relationships (functions). It reflects the nature of variety, and we usually apply the derivative to describe many phenomena when we talk about the varied processes such as monotonicity and extremum of functions so on. Only we know what and why the knowledge points can be used, we know how to use them.

With the development of computer, the computers play more and more important role in people's lives today, naturally they play very necessary role in helping students to learn mathematics, and they are auxiliary to be applied to solve practical problem in real life. Therefore, how to design some materials for students to help them learning or to solve mathematical problems with computers and software also becomes necessary and meaningful. So, we should take this into account when we intend to compile a set of mathematical analysis textbooks for normal college students. One software of MATLAB, MATHEMATICA and MAPLE should be selected to be introduced [12], which can help the students to know how to use them to solve the corresponding mathematical problems. What's more, it will provide opportunities for them to learn mathematical analysis easier and a platform for

them to solve practical problem with computer by mathematics. According to this, corresponding software materials for the right part of mathematical analysis can be added at the end of each section of the body of the textbook. In a word, the mathematical analysis textbook should apply the normal college students some resource to apply and motivate their innovation ability.

4. Summary

To a course, the textbook is the core of teaching material, which gives the outline of a subject of the basic knowledge for some region. It is a guidance for the students to learn well with, and it is also beneficial for the teacher to teach better through. As mathematical analysis textbook is one of the basic course textbooks, we should tightly keep it in mind that the textbook must be very useful for the students to learn, and be helpful and convenient for teachers to use when we compile the textbooks. For the specialty of normal college students, the content of mathematical analysis textbook should be complete in range of knowledge, which can broaden the students' horizons. Besides the completeness of content, the material and exercises of mathematical analysis for them should reflect the creativity and application of this subject, which will excite the creativity of the normal college students and guide them how to design the creative material for their future students. From the application and using software, the textbook will show the future senior or middle school teachers where the knowledge of mathematical analysis come from and what they will be applied for and how to use them. Only the textbook of mathematical analysis contains all of these above will be an excellent textbook for normal college students.

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