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Improving the Innovative Ability in the Teaching of Analytic Geometry and Functional Analysis

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Abstract

In this paper, we study how to improve the innovative ability of students based on the teaching practice of the Analytic Geometry and Functional Analysis, how to permeate its important ideas, cultivate and improve students' self-learning ability, the ability of independent thinking and problem-solving ability through the teaching of the Analytic Geometry and Functional Analysis, and put forward some ideas and suggestions on teaching reform of the functional analysis.

Keywords: Analytic Geometry, Functional Analysis, Innovative Ability.

Introduction

Analytic Geometry and Functional Analysis have obtained the rapid development are widely used in various disciplines[1-7]. Functional analysis is a new important branch in modern mathematics. It originated in the classical mathematical physics in the variational problem and boundary value problems, and summarized some important concept in classical mathematical analysis and function theory, problems and achievements, beneficial stimulation by quantum physics, modern engineering technology, and modern mechanics. It is comprehensive by using the views and methods of algebra and geometry, analysis of many problems of modern mathematics, physics and modern engineering. From the beginning of last century, the theory of partial differential equations probability theory (especially the theory of random process) and a part of computational mathematics, because of the use of functional analysis and got great development. Now, self concept and the method of functional analysis to many branches of modern pure and applied mathematics, theoretical physics and modern engineering theory penetrated, such as differential equations, probability theory, mathematical, statistical physics, quantum field theory, abstract harmonic analysis, modern control theory, a wide range of differential geometry. At the same time, functional analysis itself is constantly development, such as the spectrum of operator theory and representation theory has reached a deep level. Therefore, the research in pure and applied mathematics at any one of the workers, it is the indispensable knowledge.

The problem of how to improve the innovative ability of students based on the teaching practice of the Analytic Geometry and Functional Analysis has become an attractive research and many approaches and practitioners have been proposed to many methods[8-10].

Main Contents

As an important curriculum in both domestic and foreign math department, functional analysis combines the algebra, the analysis and the geometry in one. Its contents are rich and opaque .It has a perfect system. It theory is abstract. Because it permeate to other branches of mathematics as well as other specialties (for example physics, mechanics and so on), therefore it has a widespread application in our research.

Many institutions of higher learning have opened the functional analysis curriculum. The present engineering course's class graduate student's functional teaching faces questions mainly have the following three forms:

One, class hours are few. The study periods of many school's functional analysis curriculum are less than 60 class hours. Compares with its rich content, how to complete the teaching task in the so few time become a difficult problem which numerous teachers faced nowadays.

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Two, the quality of the students is different. The curriculums relationed to functional analysis in different local universities which students studied are different, moreover there exist individual difference. All of these increased the difficulty of teaching functional analysis.

Three, The different specialty has the different request. They choose different functional content as emphasis point by their needs. Some of them may use the least squares method principle more, some may use the open mapping and closed graph theorems more than others and so on, To grasp the discretion in class causes the student to achieve his target without waste the time and the energy, time saved on it will be spent on essential part.

In order to complete the teaching of the functional analysis, we may intend to take the corresponding measures regarding to problems referred to.

First, we must study the teaching object well, only the teacher understood fully about different student's different foundation and different specialized demands do the teacher feel confident and achieve success.

Second, choose a good textbook plays an important function in teaching it well. There are many kinds of editions of "Functional analysis" at the present time. On one hand, they have the different characteristic respectively. Some universities compile it according to their research with the theory achievement, resulting in independent systems of their own. They have different mathematics symbol and linguistics expressing the notation or the theory. on the other hand, they have the different emphasis point respectively. They describe vividly in which they considered important. When we make a choice we must synthesize various factors to consider. It includes the edition's quality, the chapter arrangement, the central content, students' foundation and study period arrangement and so on. Do not choose one too difficult or too simple. It is too difficult for students to understand. The process of study become tasteless, the effect is not good, either. Students will not know the profound theoretical knowledge of functional analysis if it is too easy. Students just know some superficial knowledge about it. Take my choice as an example, I choose a foreign language edition "John b. Conway A Course in Functional Analysis", mainly considered its content arrangement is good, At first it speaks a special space –hilbert spaces, then draws out banach spaces then based on this to study the following theorem and the application, the vein is clear. In addition it may influence subtly during study specialized knowledge by raises student's English proficiency, which help them with their later paper writing.

Third, the teacher should pay attention to the organic organization course content when preparing a lesson. We should achieve the standard that the content concept is distinct, the vein is clear, and the key is prominent. For instance, when studies a theorem we learn a relation claim firstly. It will become easier in this foundation to accept the opaque content.

Some places need the teacher make the suitable supplements. Takes notations explanation as an example, students have not studied before possibly, but they are not describe in the textbook. So teacher should tell students about it. Another way is let students consult the other edition textbook, like this may exercise student's beginning and study independently ability.

Functional analysis's contents update day by day. Its theory innovate unceasingly, the teachers should pay attention to the apply theory to reality in the teaching, not only teach the textbook knowledge but also combine the functional analysis present development theory and the application together. This method expands students' vision and improves their radiation thought.

Teacher should pursuit innovation in class, maintain the merits of the traditional teaching and reform its malpractice. The forms which teachers' adopt are diversification. How to organic choice teaching way may acts according to the content of different of the characteristic. For instance when study the best uniform approximation, the teacher may try to use special deliberation. When speak the spatial theory, they use communication and so on. It depends on the teacher.

The teacher should learn how to deal with the relationship between the teacher and students. The teacher should use methods as many as possible to arouse student's enthusiasm, Seen teacher as a guider for the students through the explanation textbook knowledge to find the problems. Students realize how further the analytical study grasp and the academic society utilize in the later scientific research by themselves.

The communication between teachers' and students' is very important. It is not a good method if the teacher is only teaches the knowledge in class. The teachers and students may carry on the discussion on some topic together which causes the student to express the opinion. Not only may it urge student's understanding, but may cause the teacher to ask know newly. Also we have a pleasure time in class.

Because of functional analysis high abstractness, the theory content obscure difficult to understand. The lacks of the direct-viewing mathematical model causes the teaching difficulty to enlarge, that is, teachers had better adopt the analogy method, unify the beforehand knowledge student had

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already studied in type example analysis. Through an example shows students how to understand it better. For instance, when speaks the notation of " hyperplane", we learn it on one dimensional first, then to multi-dimensional and even the infinite Uygur space. The students know how to get to the correct understanding about "hyperplane".

In order to solve the conflicts between class quantity and contents quality, we content to have the representative example explanation besides the organic choice teaching, generally chooses the core and the key content related examples.

Arranges the right amount and high quality homework is very important. It consolidates the knowledge which the student had already studied, raises students' independent thinking ability and the exercise mathematics ability. The teacher may assign different work according to the different student's request, emphasis on different point respectively. Student will use it more deftly later in their respective research area.

Studies the functional analysis mainly for the later application, we should take the reasonable measure to guarantee that the student grasps its core knowledge and can utilize conveniently later. We should pays attention to raise their independent thought ability and their innovation ability when teaching it.

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