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Promote Research-learning in Teaching of the Basic Theoretical Courses

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Abstract

It is an inevitable choice for college and universities to foster an innovation talent through guiding students to conduct research-learning. In order to foster a “student-oriented” concept and try to bring up the students’ research capabilities in our whole process of teaching, teachers should improve their own teaching abilities and academic levels, carry out research-teaching actively, and make it align with students’ research-learning. It develops research quality and trains students to form an awareness of research so that teachers can promote research-learning in teaching of the basic theoretical courses. This article describes the effectiveness of pilot projects and pilot cases.

Index Terms: research-learning teaching -plans; research-learning classroom; research-learning activities

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1. Introduction

Guiding college students to conduct investigative study is one of the ways to cultivate innovative talents. The *higher mathematics*, *linear algebra*, *probability and mathematical statistics* are important basic theories of compulsory course for many students in higher schools. They show logical, practical, systematic and scientific aspects of nature. But for most of the undergraduates, they are difficult and challenging. Basic knowledges, skills and basic ability have strong transference, they are very valuable for elite students whose developing directions, goals, future careers are not entirely sure [1]. Hence implement inquiry on basic theory course learning can be regarded as a kind of prospective study process, and should be the best choice in cultivating undergraduates’ research quality and training them to form the consciously research habit. Only in this way our students can obtain real gains in the usual study.

From the perspective of successful practice at home and abroad, the effective teaching mode of research has following four basic aspects [2]: (1) Science teacher drive mode, (2) course contests in pattern, (3) practice

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investigation into patterns, (4)academic societies mode. Combining the teaching of fundamental characteristics, we can consider the research- based study on teaching promotion, guide students to carry on the investigative study exploration through the "subject", "paper" way.

2. Design "research-based learning" seriously before class

In teaching activities, preparation is the first important step; teachers' preparing lessons carefully is the fundamental guarantee of teaching quality. The purpose of teaching is not only to import knowledge but also to cultivate the ability to explore education quality. The teachers' preparation should not only stay in the surface of teaching content, but keep a researcher mentality to teach and think deeply.

2.1 Select Teaching Contents Which Are Suitable for Inquiry Learning

To grasp the outline of all knowledge within hours of preparations, teachers should combine traditional teaching with research-oriented learning. It guarantees the quality of teaching simultaneously can adapt to the cultivation of students' study ability request.

Not all the teaching contents are suitable for researching classroom teaching. How to choose the research-oriented teaching material is a thing worthy of considering. Generally, the courses close to the discipline and suit for students' thinking can stimulate students' interest in study and explore the enthusiasm, and they should be considered to carry on the investigative teaching.

2.2 Design of Research-based Study Program

Inquiry learning programs include how to lead and guide students to think, how to ask students to explore and how to get conclusion. Teachers can raise questions contacting actual situations, set suspense to guide students to think, and make students to explore issues through group discussion. Finally, teachers collect conclusions and give the correct ideas. Of course, some contents may leave students to discuss after class.

2.3 Properly Optimization Textbooks and Integration Points

Education is to cultivate students' ideas and thoughts, train the student to analyze questions and the ability to solve problems. Teachers should teach students the essence of mathematics, optimize mathematical concepts, express ways of language, and find more intuitive to accept and understand expressions [3]. Teachers should integrate knowledge properly, reflect the discipline of thoughts. These "thoughts" are often more meaningful to the promotion of students' comprehensive qualities than specific knowledge.

3. Show adequately research-oriented learning mode in the class

Inquiry learning is a teaching mode which adapts to innovation education and is the core of cultivating students' innovative ability. It is in urgent need to build new teacher-student relationship [4]. Good relationship between teachers and students will affect the students' moral and learning. Independent, cooperative and negotiatory should bethe coreof the relationship between research-based learning teachers and students [5].

3.1 Teachers' Teaching Link

In traditional education system, teaching and scientific research play some roles in grasping of knowledge and exerting innovation ability, but there exists a fault in the process of research ability formation. Mathematics education is an education for all-round development, whose aim is not only to make students know many important mathematical concepts, methods and conclusions, but also to learn the spirit of mathematics and some thinking methods. Inquiry learning is to create an environment, make the students experience the founding or creation process in mathematics, encourage and guide students to solve some theoretical and practical problem. In class, teacher must mobilize the enthusiasm of students' explorative study, seize students' creative thinking promptly, and guide the spark.

The research of classroom teaching has many layers. Teachers bring about questions, students suggest ways of solving the problem through their own research, which may be a relatively easy implementation way. Through their own study, it will force students to experience knowledge deeply, help students forming the positive attitude towards scientific research gradually and grasping basic methods of scientific research. In the teaching, teachers should act well as a tutor role, create background constantly, and put forward some ideas to enlighten students' thinking. Sometimes if thinking is stranded, teachers should give hints and inspirations, but need not too carefully to stimulate students' independent thinking. It is not feasible to answer comprehensively too early, otherwise, seemingly already clear, in fact, it is difficult to let students internalize their views.

3.2 Exercise class teaching

In the process of teaching, consolidate research feelings timely and provide students the simulated training opportunity to practice and explore, so they can participate in classroom teaching actively, and feel the truly experience, knowledge and comprehensive inquiry-based learning knowledge to solve problems by the feeling. They will be likely to attempt to find the feeling of "search in the study".

The traditional exercises teaching mode often adopts the lecture method, supplemented with inspiration, demonstration and so on. Because teachers are the mainstay, it could not exert students' main role. Inquiry learning is trying to mobilize students' consciousness of participation, the specific performances are as followed: topic beforehand, students do research after class, discuss on the class, finally teachers review and summarize. So, in the process of solving all kinds of and all degrees of problems, students could reinforce their learned knowledge, maximize the potential power, so as to facilitate their research quality gradually.

4. Promote extracurricular research-oriented learning activities

The organic combination of first class and second class is the extended requirement of research study [6]. In knowledge economy modern society, for the characteristics of students, in order to train creative, besides through the course teaching in math training process, teachers can use various extracurricular innovation practice activities to enrich and deepen innovative ability, and make students' innovative ability developing into a large-scale, multi-channel and open mode.

The second class whose character is students' learning science and technology innovation system has special function in cultivating students' personality development. The deepening of education reform need to break traditional education shackle, eliminate the wall of the two "classroom" in talents cultivation, make innovation education whose main content is science and technology innovation activities, gradually step into the formal teaching system, and provide students with a comprehensive training innovative spirit, environment and atmosphere.

Students have enormous research-oriented learning enthusiasm and potential, when they realize the importance of research-based study, there will be a strong desire for research-based learning. Therefore, teachers

should exploit and help students erecting the notion of “learning math is doing research on math” in various colorful math activities. Through modeling training, course contests, mathematical experiment and such diverse forms of teaching activities to strengthen research-oriented learning ability. Teachers should guide students to make full use of the advantage of university library resources and multimedia information technology, collect useful investigative study materials, and carry out research-based learning activities actively.

4.1 Design Open Question; Active Students' Thinking

Teachers should choose and design a series of interesting, easy moderate activity situations. Through creating attractive mathematical activities, students' learning initiative to explore new atmosphere, make various interesting mathematical activities constitute the main core of research-oriented learning.

4.2 Combining Curriculum Guide The Student to Carry on The "subject" Of The Research

Subject is very important in the research-based study. Students can experience the whole process from searching for topics, searching for literature to project research and paper writing. This process requires teachers to play a leading role and students to play an active role. In teaching course, teachers should show the history of science, explain the thought of forming subject, interpret and explain the literature search method, and provide students with writing instruction.

5. Effect and enlightenment

In the teaching of basic courses, introduce scientific research subject imitating, it can not only let a student learn and improve their learning efficiency, but also can train students to explore the spirit of innovation and practice, so that the students are becoming “the researchers who are studying”.

To implement and improve undergraduates research-oriented learning effectively, teachers must find strategies to eliminate the restricting factors [7].

First, the schools must adapt and improve the construction of research-based teaching and modern teaching environment, this will support the model of research-oriented teaching system level or policy level. To improve the teaching management mode of research-based teaching, including the establishment of relative balance between teaching and scientific research, guide the teachers to combine with teaching and scientific research so as to promote the improvement of teaching quality.

Second, the teachers should advocate the research-oriented teaching concept actively; create a freedom, equality, trust and cooperation autonomy learning environment. Guide the student to carry on the investigative study effectively. Organization and implementation of classroom teaching is the key to improve teaching and research level. Teachers should change the role from classroom organization executor to research-oriented study participants, promoters, pilot and guides.

Third, students must set up the namely research-oriented study concept, change from "let me learn" into "I want to learn". Students must cultivate active learning interest and ability consciously, from a purely intellectual recipient into a conscious researcher. They should participate in classroom teaching and solve the problems actively, try to design the whole teaching process and cultivate their ability through the practice of research-based learning.

Additionally, it's inadequate only rely on the school's hard work, it need support from the whole society, especially the government and education administrative department. Through the policy guidance, it will promote the implement of university inquiry learning effectively.

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