

A Research on Applied Teaching of Mathematics at Higher Vocational Colleges

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Abstract. Since the 1990s, mathematics applied teaching course has begun to rise at Chinese higher vocational colleges and become one of the hot spots of mathematics teaching. However, since higher vocational colleges are limited by credit hours, the degree to which schools develop experimental teaching has not been improved but only accounted for a small proportion (only about 30%). As mathematics education of higher vocational colleges develops constantly, course reform of higher vocational colleges is imperative. As mathematics is a basic course for higher vocational colleges, teachers should pay attention to cultivating students' application consciousness in the process of teaching. This thesis mainly focuses on analyzing definition and features of applied teaching of mathematics, current situations and problems of higher vocational colleges' teaching as well as methods and suggestions for implementation of applied teaching of mathematics at higher vocational colleges, and proposes several reasonable suggestions to improve teaching quality by cultivating students' consciousness of mathematics learning.

Introduction

As social economy develops rapidly, talent becomes increasingly important, employers' requirements for employees' quality are also higher and higher and all industries require more talent with splendid vocational ability. As an important member of vocational education, higher vocational colleges must exert features of their vocational education. G Polia an American educator deems that the most effective way to learn all things is to discover them by ourselves. This has similar meaning with the sentence 'interest is the best teacher' because both of them emphasize students should discover problems in the process of teaching and lay stress on importance of problem-solving. About mathematics teaching, lay stress on a famous scholar also said mathematics not only needed theoretical learning but also should carry out continuous observation and do experiments. Thus, it is obvious that mathematics that servers as a subject has strong practicalness. By guiding students to have a guess and do practice, we can arouse students' interest in study. The following content will mainly center on analyzing applied teaching of mathematics at higher vocational colleges simply, implement analyses of current situations of higher vocational colleges and propose several reasonable suggestions.

Main features of applied teaching of mathematics at higher vocational colleges

Applied teaching of mathematics is mainly featured by the situation that its uses questioning as its main method and enables students to investigate and solve mathematical puzzles by questions, with help of powerful functions of computer and via guiding students to use related approaches. In this process, it is inevitable that students will encounter setbacks. However, cultivation of students' interest in learning mathematics in the process of teaching can establish students' confidence effectively. Thus, it is essential to master main features of applied teaching of mathematics.

Mathematics teaching of higher vocational colleges uses students as subjects

In the process of teaching, teachers should pay attention to the point that students are subjects of teaching and teachers only play the role of leading people and partners. Teachers must explain generation and development of mathematical concepts in the process of teaching, ask students to do experimental operation, obtain corresponding knowledge and materials by operating computer and

summarize mathematical laws in order that they can not only master mathematical skills effectively but also improve students enthusiasm for learning by continuous verification in practice.

Directing at problems to carry out teaching

Directing at problems to carry out teaching is a core of applied teaching of mathematics. In detail, ‘problem’ is the most important, which requires students should quantitative opinions to observe and analyze mathematical phenomena and find ways to solve problems, and emphasizes that students should start with exiting knowledge and use knowledge points that they have learned to give experimental summarization of mathematics. It can be said that mathematical activities are established based on students’ existing knowledge.

Current situations of applied teaching of mathematics at higher vocational colleges

Since applied teaching of mathematics at higher vocational colleges started late, it still has many disadvantages after a series of development. The following content will focus on introducing this in detail.

Teachers’ insufficient cognition about application mathematics

Since most teachers are affected by traditional teaching modes, they mainly follow traditional teaching modes in learning and teaching and impart a great deal of content with high difficulty to students by large-capacity explanation. However, students still stay in a position where they accept knowledge passively to a large extent, which results in the situation that classroom teaching is depressing and lacks vitality and energy. Teachers primarily implement robotistic explanation in the process in which lessons are given, and students do not have changes to ask questions when they have something that they cannot comprehend. As a result, students’ enthusiasm for learning is affected seriously. According to surveys, it is shown that 69% of students lack chances to do experiments at laboratory and some students’ practical capability is poor because they lack ability to do things personally. Then, quality of applied teaching of mathematics is affected largely.

There are conflicts between college teaching and professional learning

Cultivation of students mainly target future employment. Thus, mathematics teaching should use practicability as a principle in the process of teaching and improve students’ learning quality constantly when teaching is enhanced. However, the problem that specialized courses conflict with basic courses appears in some schools in the process of teaching. Some schools extend credit hours of practical courses, but the ones of theoretical courses reduce. Thus, students’ learning in theoretical courses is affected and demands of courses cannot be satisfied.

Students’ practical capability is poor

Students’ poor practical capability is a main problem appearing in teaching of higher vocation colleges in China at present. While finishing theoretical courses, students show much talent and can solve mathematical problems by theoretical knowledge that they have mastered. However, students’ practical level is not improved. This research conducted a survey on 320 students from higher vocational colleges and the questionnaire investigated what things made students feel difficult in experiments. Some students said experimental steps were troublesome sometimes and they wanted to give up when they encountered difficulty. This reflects that students’ practical level is low. On the other hand, it also shows that some students lack confidence in overcoming difficulty.

Main ways to improve effect of applied teaching of mathematics at higher vocational colleges

Applied teaching of mathematics pays much attention to practicalness. In the process of higher vocational colleges’ teaching, teachers must guide students to take part in practice constantly and cultivate students’ practical ability. The following content will center on analyze main ways of applied teaching of mathematics at higher vocational colleges.

The teaching principle that pays attention to combination of mathematical practice and theory

On the one hand, applied teaching of mathematics at higher vocational colleges can facilitate students to learn and master theoretical knowledge. On the other hand, it can solve conflicts in students' practical work effectively. At the same time, students can understand the subject mathematics profoundly by practice. In addition to mastering basic learning methods and theories, corresponding teaching knowledge may be supplemented in the process of practice to make them form a complementary relationship. Thus, if students do experiments personally in the process of learning, it will be helpful for them to comprehend mathematical knowledge and improve teaching quality effectively.

Teaching should focus on reflecting interestingness

Students' learning is affected by interestingness of learning to a large extent. Consequently, in the process of teaching, teachers should not concentrate on explaining a great deal of theoretical knowledge but pay attention to improving students' interest in study and explain knowledge by selecting appropriate examples in the process in which they explain theoretical knowledge in order than students can feel interestingness of learning and improve their interest in study. Additionally, since mathematical experiments hold important position at higher vocational colleges and teachers must give consideration to the two aspects, i.e., theoretical teaching and practical teaching, it is inevitable that they ignore teaching of one aspects. Thus, it is essential to cultivate students' autonomous learning and positive hinting, improve their enthusiasm for mathematics learning and enable them to feel interestingness of mathematics in daily teaching. In combination with practical content teaching, students' enthusiasm for learning can be aroused easily.

Carry out teaching by regarding students as subjects

The teaching mode whose subjects are students mainly aims at making students use mathematical knowledge to solve problems in the process of learning. It can be said that it is very important to cultivate students' ability to solve problems because this can satisfy demands of high-quality talent cultivation in the new period. The objective of students learning mathematics at higher vocational colleges is different from that of students at undergraduate colleges. In detail, students at higher vocational colleges mainly direct at using mathematical knowledge to solve problems in life by learning mathematics, which requires that the mathematical knowledge learned by them must serve daily life. Thus, teachers should give guidance, encourage students to do more experiments and improve their practical ability when they give lessons.

For instance, an information technology college of China began to implement applied teaching of mathematics mode in 2010 and teachers divided mathematics teaching into five aspects which mainly included the module about differential of unary function, the module about unary function integration, the module about calculus of multivariate function and the module about engineering mathematics. After teachers have imparted theoretical knowledge, teachers apply each module to complicated mathematical operation and guide students how to use software like Mathematica, SAS, SPSS, STATA and Matlab. After a series of experiments, teachers succeed in reducing teaching difficulty, saving much teaching time and improving teaching quality.

Pay attention to implementing teaching by following principles of creativity and innovation

Innovative teaching consciousness is a kind of burgeoning teaching consciousness as well as one of the teaching objectives of schools. In the process of teaching, teachers must construct bridges to cultivate students' innovation ability and encourage students to solve practical problems rather than repeat and follow previous methods mechanically. Besides, teachers must select appropriate experimental topics according to students' learning situations and finish mathematical experiments based on limited theories in order to prevent students from losing patience and enthusiasm for learning in the process of learning effectively.

For instance, a higher vocational college pays much attention to completeness of completeness in the process of applied teaching of mathematics. However, since it pays excessive stress on completeness when it uses teaching materials, it takes old cramming method, tries to impart all knowledge points in limited practice and treats completion of tasks as a goal. Such a teaching method

goes against students' learning. In addition, students cannot feel pleasure brought by mathematics learning. Thus, after educational reform, teachers choose content of teaching materials reasonably and exclude some fussy and unnecessary knowledge points. By refined explanation, students can understand knowledge they are learning clearly. Then, teachers impart matched knowledge by explaining knowledge related to mathematics and engineering mathematics in practical courses, which attracts students' attention effectively. While giving lessons, teachers remind students of combining theoretical knowledge with practical knowledge to carry out study. This improves students' ability to apply knowledge they have learned efficiently.

In addition, since content of mathematical experiments involved in some textbooks is limited, they are not helpful for students' reading and some necessary practical teaching content exceeds scope of students' learning, selection of teaching content must center on students and aim at reflecting students' learning ability and future development.

For example, in the process in which a higher vocational college gives lessons, students do not know how to prove $\lim_{n \rightarrow \infty} (1 + \frac{1}{n})^n = e$ because their comprehensive ability is poor. As a result, it is difficult to practice this method used to prove limit. Thus, teaching mainly use visualization function of Matlab to help students establish the process of limit formation. The experimental task is shown as follows.

Experimental task: observe variation trend of the sequence $X_n = (1 + \frac{1}{n})^n$ when $n \rightarrow \infty$ and point out limit of the sequence.

Teachers may explain definition of limit, i.e., if $n \rightarrow \infty$ and the sequence $X_n \rightarrow A$, the constant A will be called Sequence X_n so that the formula can be expressed as $X_n \rightarrow A$. By explaining this kind of definitions, teachers use MATLAB software to demonstrate ways to solve limit of the sequence and ask students to observe process of limit of the sequence in order to enhance their comprehension about concepts of limit after students have finished comprehension.

After finishing explanation, teachers may ask students to implement discussion in groups after school and make full preparation for practical computer practice in classroom by establishing and evolving mathematical models. After using software like Mathematica, SAS, SPSS, STATA and Matlab to obtain numerical solutions, students may write experimental reports.

Here is another example. For students majoring in Economics, teachers must cultivate their reading and application level. Take installment for example. First of all, teachers may explain major definition of installment in classroom and ask students to discuss with one another timely by providing corresponding cases for explanation. Meanwhile, teachers may let students finish interest calculation by grouping and in the form of group cooperation and perform calculation in classroom via using theoretical knowledge that they have learned to establish mathematical models.

Conclusion

Mathematics is a subject with obvious applicability, so we must enhance our cognition of it by experiments in the process of learning. Especially for higher vocational colleges focus on cultivating students' practical ability, teachers' teaching must aim at improving students' practical ability. By discussion and analyzing students from some higher vocational colleges, this survey analyzes main problems that Chinese higher vocational colleges have in applied teaching of mathematics and combines with examples to propose several reasonable requirements. In doing so, it hopes that school can change their traditional teaching concepts, strengthen application knowledge teaching of mathematics constantly and make every effort to combine theories with practice in order to promote students' enthusiasm for learning effectively, improve learning quality and cultivate practical talent needed by the society.

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