

Integrating Information Technology into College Mathematics Teaching

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Abstract:

Information technology mainly refers to a microelectronics-based combination of computers and networks that helps to produce, manipulate, store and communicate information while educational technology mainly refers to the way of teaching methods or models. With the rapid development of information technology, especially network technology, modern education technology is playing an increasingly important role in today's curriculum. Integrating information technology into college mathematics teaching model is an important aspect of mathematics teaching reform in the future. By describing the significance of modern education technology in college mathematics teaching, this paper studies about the integrative teaching model of college mathematics in the information technology environment, the implementation steps and implementation case about this model.

Keywords: College Mathematics; Information Technology; Teaching Model; Integrative Teaching Model

1. Introduction

Information technology mainly refers to the multimedia technology of a microelectronics-based combination of computers and networks that helps to produce, manipulate, store and communicate information while educational technology mainly refers to the way of teaching methods or models. Integrating information technology and education technology into college mathematics curriculum can improve the efficiency of mathematics classroom teaching and external classroom learning effect. Information technology, aided with computer as an effective tool, has been widely used in college classroom teaching. By presenting the mathematics information in rich and vivid forms, the computer-aided multimedia technology changes the single, poor visual defects of traditional classroom teaching. In the information age, there is a must to integrate advanced information technology into mathematics teaching. However, it does not mean that information technology could replace teachers' status and role. Information technology and education technology should be complementary to each other for their own advantages. This paper mainly studies about the integrative teaching model of college mathematics in the information technology environment, the

implementation steps and implementation case about this model.

2. The connotation of modern education technology

Modern education technology refers to the application of the modern education thoughts and theories, modern information technology and systematic methods in the process of designing, developing, utilizing, evaluating and managing the teaching and learning resources to improve and optimize the effect of education theory and practice. In particular, the modern education thought includes the modern educational concepts, the content of modern learning concept and modern concept of talents; the modern education theory, including modern learning theory, modern teaching theory and the theory of modern communications. Modern information technology is mainly referred to the multimedia computer and network environment (including other teaching media), the innovation process of the information acquisition, storage, processing, which includes the operational skills required in the computer and network environment, and the application of network and computer technology in teaching and learning; systematic method refers to the integration of the scientific system in education or teaching, with the representative theories and methodologies of teaching design.

Modern education technology includes two modules: one is the modern education thoughts and theories; the other is the modern information technology and systematic approach. Modern education technology differs from traditional education technology; the former is the technology to use modern natural science, engineering, and modern theory and achievement of social science in developing technology related to education teaching, in order to improve the quality and outcome of teaching and education. It covers the technology that teachers should master, the education idea, forms and means in teaching methods, management and arrangement of teaching environment and innovation and reform of teaching contents. At the same time, it also explores how to use a variety of learning resources to maximize the effect of teaching, studies on how to apply the new achievements of science and technology into education technology. All in all, the modern education technology is based on the modern education theories and methods, guided by the viewpoint of System Theory and by means of modern information technology, throughout the process of teaching resource design,

development, evaluation and management, to achieve the optimizing effect of teaching theory and practice.

3. Modern education technology in higher mathematics teaching

3.1 Using the modern education technology to improve the speed and quality of teaching content

Higher mathematics has own special expression of the subject matter: first, it uses sign language which is concise and accurate; Second, it employs geometrical language, which is vivid and direct. As higher mathematics has such characteristics, in the teaching process, written language can not transmit information completely and accurately. Also the characteristics of higher mathematics classroom teaching is determined to present on the blackboard with a large number of writing and drawing. For example, the complete presentation of concepts, theorem, proof and so on all has to be done by writing on the blackboard; when dealing with analytic geometry, the interpretation of knowledge are usually accompanied by a large number of drawings. Since the writing and drawing needs to be done by teachers, classroom time was taken up in the process of writing and demonstration by hand, seriously affecting the teaching effect. By contrast, if the classroom teaching can take advantage of modern education technology, with teachers' well-prepared courseware, the classroom will not only save a lot of time, but make students more clearly observe the teaching process, thus greatly improving the teaching effect of the classroom.

3.2 Using the modern education technology to dynamically present the teaching thought

Higher mathematics studies "variables" full of dynamic process of the mathematics thoughts. For example, when explaining the concept of "limit", the concept of "infinite approach" need to be presented, and "infinite approach" alone is difficult to be clearly presented only by verbal language. The explanation of these concepts, concerning a dynamic process, needs the employment of "animation", so the traditional teaching mode is difficult to make clear this dynamic process, and very often it is only explained to the students by "is" or "as", in this way many students can not understand the dynamic process clearly, seriously affecting the learning effects. Therefore, teachers can resort to modern information technology such as multimedia or mathematical software, animation into the teaching process, to dynamically address these contents, making the abstract theory vivid, intuitive and natural, for students to enhance the learning effect.

3.3 Using modern education technology to solve student's questions.

In the process of learning higher mathematics, everyone will inevitably have a lot of questions. In the traditional classroom, generally speaking, teachers may solve these problems through students discussion with each other. The feedback effect of this question and

answer method is poorer in timeliness and convenience, to a large extent affecting the students' study enthusiasm. However, modern education technology provides a new way of thinking to solve such problems. Despite the limitation of objective conditions, although colleges and universities could not provide a computer and networking conditions in every classroom, in the center of the library, information technology, dormitory can meet these conditions. Students can learn to solve their problems and confusion timely online, by communicating with other students and teachers, which is not only beneficial to solve the problem in time, can also arouse students' interest in learning, the enthusiasm for learning, thus enhancing learning effect.

3.4 Using the modern education technology in exercises teaching

Mathematics knowledge needs a lot of practice to fully digest, absorb. However, according to many years of teaching practice, the author found that the traditional education mode of exercises teaching is poorer in effect, because the traditional way of education only takes into consideration the students' ability to accept, without caring about the needs of all students. Teachers, in the higher mathematics teaching, however, can reasonably employ the modern education technology to solve this problem by setting a local area network (LAN) to carry out classroom activities. Each student can handle the personalized practice and make self-assessment of their own learning in the evaluation system according to their actual needs. If one can't understand some concept, he can get timely feedback, by discussing with teachers and classmates. This allows students to enhance the learning initiative and enthusiasm, thinking more active, which is beneficial to cultivate the students' innovation ability, thus improving the teaching effect of higher mathematics.

4. Integration of information technology and education technology

4.1 Integration of classroom interpretation and the courseware

It is shown that the higher mathematics coursewares are mostly produced according to the fixed teaching mode, which is easy to put the teachers and students in a preset condition, leading to ineffective communication between teachers and students. Computers can never replace teachers' role in the teaching because teachers' interpretation is coherent, vivid, inspirational, focused, reasonable with the layout on blackboard, to organize students' cooperation and communication, inspire students' positive thinking, and guide students to learn to study, analyse and evaluate their learning level. In classroom, coursewares can only be used for a few minutes to help teachers clearly explain the problem which can not be interpreted with the help of traditional teaching instruments. In the form of 2-D or 3-D animation to process the content of the information with

image output, displayed on the screen by micro amplification, macroscopic shrinkage, or instant slowdown, the content of abstract theory is easy to observe clearly in a short period of time, mobilizing students' various senses to participate in the classroom activity, thus making the students get dynamic image information, and forming a distinctive perceptual knowledge. With fragment-type coursewares, the instructions are effective to turn the static interpretation into dynamic teaching, which is direct to the point, accessible to the solution of the difficult points, open to stimulate students' interests. In the mathematics classroom, the charm of multimedia teaching lies in the application of information technology in developing mathematical concepts and cultivating students' imagination. Mathematics teaching is the interactive process of mathematics activities between teachers and students. Teachers are organizers, partners, directors of the students' learning activities while students are the active participants and discoverers of cooperative learning and inquiry. The information technology sets up the teaching situation, in which teachers and students exchange and cooperate with one another to learn, understand, discover, hence for students to construct their own knowledge structure and to gain new knowledge.

4.2 Integration of the computer demonstration and blackboard

Systematic blackboard writing is the bridge for students to turn perceptual knowledge into rational knowledge. Mathematics classroom teaching cannot be separated from the blackboard writing. However, when multimedia courseware comes into the classroom, some teachers ignore the traditional teaching means by putting teaching design in the coursewares. In classrooms, teachers are often found to keep the mouse in operation, as is required by the screen, with students only passively accepting, mechanically memorising. The lively classroom teaching was manipulated by a mechanical computer, thus inhibiting the students' thinking, leading the classroom to suffocation. In this teaching environment, students cannot have much space of learning activities, losing the enthusiasm in autonomous learning. In fact, the use of modern information technology does not mean to leave alone the blackboard writing, which can clearly present the overall structure of knowledge to the students. And when writing on the blackboard students have time to think and opportunity to reflect, ask. Therefore, this is indispensable in the process of teaching. Hence, the integration of computer demonstration and the blackboard writing is the key to teach and learn higher mathematics.

4.3 Integration of direct observation and abstraction

Mathematics is an abstract science. In the process of abstraction, as Professor Xu Lizhi pointed out: "Generally speaking, there are four steps in mathematical abstraction as follows: (1) observing the instances; (2)

seizing the commonness; (3) raising the concepts; (4) constructing system or framework (theory). " Direct observation is the thinking process of human mind by using images (representation), which is generated on the basis of perception. Making full use of multimedia to show mathematical facts can well make students' sensation and perception in a full play, develop students' ability of image thinking, and make students experience the relation between intuition and abstraction, perceive in observation and reinforce understanding and perception, so that students can achieve a deep understanding of mathematics contents in the process of abstraction, intuition and abstraction. Although direct observation is helpful to develop students' interests and contributive to the understanding of knowledge, it is not the ultimate goal. We should be further cultivate students' image thinking on the basis of direct observation, and develop their intuitive abilities, and then abstract thinking and rational knowledge. If teaching was operated with intuitive, inappropriate and excessive presentations based on multimedia, it would reduce the level of students' thinking, affecting the development of students' thinking. Researches have shown that students' psychological dependence on inert graphics and images could easily get them into a single pattern of linear thinking. It is not conducive to students' follow-up courses if blindly compromising the students' thinking ability. Such cases can be found in universities abroad. When the computer-aided teaching became popular in the United States, and some university teachers interpret and analyse the mathematical concepts and theorems by taking advantage of quick and direct demonstration of images and graphs in presenting differential and integral thought, which made students learn enjoyable and teachers teach relaxed, but the trouble was soon reflected in the subsequent courses. These teachers found, in teaching of complex function and real variable function, that the students' abstract thinking ability is too low to understand relative concepts or theories, then the teachers had to make up mathematical analysis class, which is actually the training class of abstract thinking, for the students. So, higher mathematics teaching by using information technology must be moderately presented with typicality. The aim of using information technology is to make students draw the abstract conclusion, improving the ability of abstract thinking. When students construct a mathematical concept by generalizing the concrete facts, on the one hand, they should be clear about the background of the fact, by referring to their previous knowledge learned, and could develop their ability of abstract thinking in the process of observation, comparison, induction and deduction; and on the other hand, after the initial step of conceptualization or discovery of principles, students must be guided to the analysis of the expressive structures of those concepts or conclusions,

understanding that their abstraction comes out from a lower level of concrete facts to a higher level of generalization. The activation of students' thinking can help students think from image to abstraction. When students has accumulated a certain perceptual knowledge, teachers shoul guide them to generalize, reinforcing their understanding of the rational stage, thus in the whole process of teaching and learning, developing and improving the students' abstract thinking ability.

4.4 Integation of in-class teaching and after-class learning

Extracurricular learning is the teaching plan unconstrained by the syllabus. It is a planned, purposeful, organized teaching and learning process volunteered by students under the teachers' guidance. The content of the activity is more flexible and elastic. During the teaching and learning process, students have more choices, more opportunities of practice, thus it is more suitable for students because it is baed on their aptitude. This can exert students' learning enthusiasm, initiative, fully develop their vision, expand their knowledge, by increasing their interests and developing their special talents. At the same time after-class learning can help consolidate the knowledge and skills of classroom learning. Therefore, an effective way to improve the quality of higher mathematics teaching is to establish, by the use of information technology, a suitable website of higher mathematics teaching to carry out extracurricular learning activities and classroom teaching activities. As a website of extracurricular activities, it is of great

significance to demonstrate the education value, goal and teaching and learning style of higher mathematics. This requires to combine the application of information technology and renewal of the education concept, making efforts to integrate information technology into mathematics education, and finally making students better grasp the method of learning and thinking and achieving the goal of improving college students' mathematical quality.

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