

## Discussion on Diversified Teaching Methods of Medical Statistics Based on Constructivism

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**Abstract:** Medical statistics is an important compulsory course for medical students, and it is also an important tool for medical workers to correctly understand the objective laws of medicine and its related fields, sum up work experience, and carry out medical research and disease prevention and control work. Traditional teaching methods are mainly classroom teaching and experimental teaching, lack of interaction between teachers and students, and students are mainly passive in accepting knowledge. Traditional teaching holds that knowledge can be transmitted to learners through language and other means. Constructivists believe that knowledge is not acquired through teachers. Constructivism emphasizes students' active exploration of knowledge, active discovery and active construction of the meaning of the learned knowledge. Based on the reform of medical statistics practice teaching, this paper explores a new mode of diversified medical statistics practice teaching based on constructivism.

### 1. Introduction

The progress of science and technology, the change of medical model and people's unremitting pursuit of health all put forward new requirements for the cultivation of medical students [1]. Compared with other basic medical courses, the concepts and theories of medical statistics are very abstract, involving more formulas and calculations, which are difficult for medical students to understand and master. Due to the abstract concepts and principles of statistics, analysis methods are very rich and practical. The traditional teaching method has its disadvantages in the current teaching and the teaching effect is not ideal. Traditional teaching holds that knowledge can be transmitted to learners through language and other means. Constructivists believe that knowledge is not acquired through teachers. Constructivist teaching mode believes that students are the active constructors of knowledge meaning. They should give full play to the initiative and enthusiasm of students and use environmental factors such as situation, cooperation and conversation to complete the meaning construction of the learned knowledge [2]. Constructivism emphasizes students' active exploration of knowledge, active discovery and active construction of the meaning of the learned knowledge. Based on the reform of medical statistics practice teaching, this paper explores a new mode of diversified medical statistics practice teaching based on constructivism.

### 2. Connotation of Constructivism Theory

Constructivism holds that in the teaching process, knowledge is not instilled by teachers, but is actively constructed on the basis of students' existing knowledge structure through cooperation, discussion, communication (including guidance and help provided by teachers) and with the help of necessary information resources [3]. This kind of teaching mode is teacher-oriented and student-centered, and is especially suitable for a class of subjects with strong practicality, including medical statistics. Relying on students' own active learning, they can personally experience the whole process from identifying the target to reaching the target. Constructivism puts forward higher requirements for teachers. Clinical teachers should not only have solid medical basic theoretical knowledge, strict clinical thinking ability and skilled practical operation ability, but also have

profound humanistic background. This teaching mode gives full play to students' subjective initiative and is conducive to the cultivation of students' innovative spirit and practical ability. Constructive learning theory points out that learners obtain it through meaning construction with the help of others and necessary learning materials under certain situations [4]. Help students to solve practical problems in experiments. Taking part in learning with problems fully reflects the students' autonomous learning ability. This method emphasizes the importance of teaching situations, so that students can explore events and solve problems in real or simulated real situations. Therefore, it is very beneficial to the formation and development of students' cognitive structure, that is, the construction of students' meaning about the current knowledge, which is incomparable to other media or other teaching environments.

### **3. Current Situation of Medical Statistics Teaching**

#### **3.1 Students Have a Weak Foundation in Mathematics**

Medical statistics is an important compulsory course for medical students, and it is also an important tool for medical workers to correctly understand the objective laws of medicine and its related fields, sum up work experience, and carry out medical research and disease prevention and control work. The basic courses of medical statistics are advanced mathematics and probability theory. Most medical students only learned a little knowledge of this aspect in high school. Medical students think that the course of statistics is very difficult and difficult to learn, which may be related to the depth of relevant mathematical knowledge. In addition, the relative shortage of class hours is also an important reason. Medical statistics is based on probability theory and mathematical statistics. It has many concepts, many formulas, strong connection with mathematics and high requirements on students' logical thinking ability. Traditional teaching methods are mainly classroom teaching and experimental teaching, lack of interaction between teachers and students, and students are mainly passive in accepting knowledge. Listening, memorizing and memorizing are still common methods for students. Students are always in a passive position and their knowledge is rigid, static and past. Some students reflected that listening to lectures is like listening to "heavenly books", which makes it difficult for some students with poor foundation to persist.

#### **3.2 Teaching Methods and Assessment Methods Are Single**

The traditional teaching method is that teachers mainly teach statistical principles, students' foundation is weak, knowledge cohesion is improper, and practical lessons are few and far between, leading most people to think that learning and application are very disjointed, and many students cannot use and do not understand. At the same time, some teachers pay too much attention to the derivation of formulas in their teaching, and the calculation is complicated, which leads to students' fear and boredom with the study of statistics. Teachers have the problem of emphasizing the foundation but neglecting the application in teaching practice. It is easy to guide students to only pay attention to the calculation of learning statistical methods and neglect to cultivate students' statistical thinking. However, medical statistics is a discipline with strong theoretical, logical and unique thinking. It has a large number of mathematical formulas and theoretical argumentation, which requires students to have good abstract thinking ability. Compared with blackboard writing teaching, it can display charts more beautifully and accurately, and even add animation and sound effects to carry out teaching with illustrations [5]; Only by continuously acquiring new knowledge throughout life, learning and absorbing new knowledge and technology consciously and actively according to social needs and self-will in time, and continuously improving, adjusting and updating their knowledge structure can they keep up with the needs of medical development.

#### **3.3 The Textbook Does Not Match the Teaching Content**

The examples in the textbook are all compiled by editors after processing and practicing the actual problems. The original taste of the problems is very little, the questions are direct and the data are collated. Medical statistics pays attention to practice, and it is necessary to apply statistics

from the design, implementation and data processing of scientific research projects. The communication between teachers and students is not smooth when imparting knowledge, they do not understand it in class, and they do not review it carefully after class. When it comes to using it, they are often helpless, resulting in many loopholes in statistical treatment of medical students' topics [6]. Teachers' classroom explanations tend to be biased towards the introduction of basic concepts and the calculation process of examples, while neglecting the training of students' statistical thinking, which leads to students indulging in a large number of formulas and calculations, thus virtually preventing students' innovative thinking from being trained [7]. Multimedia is not the best teaching method for all teaching contents, such as statistical reasoning, but the effect of multimedia teaching is not ideal. This makes it difficult for students to find the best way to solve the problem, and it is easy to cause misuse of the method and affect the results of statistical analysis.

#### 4. Reform Practice of Medical Statistics Theory Teaching

##### 4.1 Reform the Teaching Mode and Give Full Play to Students' Autonomous Learning Ability

Problem-based learning is a teaching mode advocated by constructivism learning theory. This kind of teaching mode is teacher-oriented and student-centered, and is especially suitable for a class of subjects with strong practicality, including medical statistics. To provide a conceptual framework for students to actively discover and explore knowledge, so that students can master, construct and internalize the knowledge and skills they have learned, and finally remove the support to enable students to achieve the goal of independent knowledge learning [8]. In this mode, students are active constructors of knowledge meaning, not passive recipients of external stimuli. Teachers are organizers, guides, helpers and promoters of meaning construction in the teaching process. On the basis of in-depth analysis of the characteristics of the teaching content and the current teaching situation, teaching students according to their aptitude.

The integration of medical statistics courses into statistics-related software facilitates students to review and review the theoretical knowledge of statistics at any time in the process of learning the software, further deepening the understanding of theoretical knowledge, and at the same time achieving a close combination of theory and practice. Fig. 1 shows a student-centered teaching model.

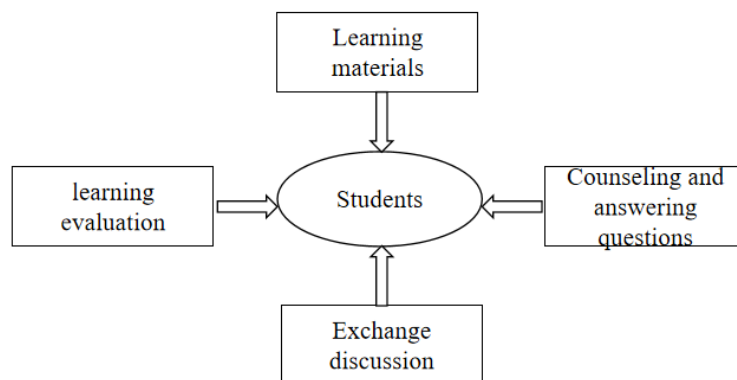


Fig.1 Student-Centered Teaching Model

We should combine the advantages of traditional and modern teaching methods and adopt diversified methods to implement teaching. And as clear and simplified as possible, it is used as an example throughout the teaching of undergraduate students in public health college. With the development of statistical analysis methods, it has received better teaching results. The sharing of resources is effectively realized and the preparation time of each teacher is saved. At the same time, the comprehensive and accurate grasp of the content of the teaching materials and the progress with the times are also achieved. Teachers can also use multimedia presentations to let students know and be familiar with the use of these software. When teaching, teachers emphasize the application

conditions of various methods and do not need to waste a lot of energy on the calculation of data.

#### **4.2 Strengthen Understanding, Weaken Memory and Calculation**

Standard deviation and standard error are very important concepts in statistics. It is easier to find out through comparison: the two are essentially the same, both are indicators to describe the degree of variation of data, the difference is that the objects they describe are different; In traditional teaching, students often only pay attention to the application of the explanation method itself, ignoring the mathematical basis and theoretical basis of the method. Students cannot really understand the cause and effect of the method, and can only passively accept it through memory. They feel boring and difficult to learn. Constructivist teaching mode requires textbooks to follow the “top-down” design sequence, first have a simple scientific conceptual framework, introduce necessary background knowledge, and then provide reference information resources to seek ways of information resources [9]. Teaching under the guidance of constructivism theory is conducive to the mastery and application of theoretical knowledge. On the basis of teaching basic statistical concepts and methods, the deduction of theoretical formulas should be shortened appropriately, for example, the deduction and calculation of theoretical formulas for T statistics. The process evaluation includes comprehensive evaluation of students' learning effects in various aspects such as the results of online homework and online tests, the frequency of participating in communication in course discussions, and the degree of personalized learning. To train medical students' sensitivity to information and improve their ability to use information resources, so that information literacy can truly become one of their basic qualities.

#### **4.3 Multiple Assessment, Comprehensive Evaluation**

Diversified teaching modes are beneficial to the continuous updating of teachers' knowledge structure. The content of special lectures must keep pace with the development of the times. To make teaching time more sufficient, flexible and content more targeted is conducive to improving the quality of medical scientific research work. Some typical examples of misuse have attracted attention. Then the correct analysis method is given in the analysis of misuse examples, and the analysis ideas are also introduced. Therefore, in our teaching, we briefly introduce the definition and nature of the mean and variance of random variables and the requirements for estimating the overall parameters from sample statistics, so that students can understand the mathematical meaning of freedom and clearly understand the calculation formula of sample standard deviation. In order to make the measurement data, counting data and grade grouping data have corresponding correlation coefficient indexes and make the theoretical system more complete, it is necessary to briefly list the connection numbers. Through proposing and exchanging different viewpoints, students' understanding of current problems can be supplemented, corrected and deepened. The purpose of the examination is to promote students to master the statistical thinking and design methods of scientific research and design, as well as the ability of data analysis and result interpretation, so as to lay a solid foundation for medical students to carry out scientific research.

#### **4.4 Pay Attention to Teaching Practice**

In the teaching of medical statistics, experimental class is a very important link. Its purpose is to deepen students' understanding of theoretical knowledge and train students' practical operation skills. Let students try to analyze cases and propose ideas to solve cases, thus leading to statistical ideas and ideas, and then put forward corresponding statistical analysis methods to solve case problems and statistical problems in teaching materials. In order to make it easier for students to remember and master the characteristics of microorganisms, teachers make full use of network resources to add all kinds of exquisite pictures of microorganisms to the courseware and display them vividly to students through PPT. In order to effectively implement the principle of student-centered teaching, the number of theoretical teaching hours is appropriately reduced in the new training scheme, and the number of practical teaching hours and the proportion of elective courses are increased. Set up the concept of strengthening students' independent learning ability and cultivating innovative spirit, and give students more environment for independent learning. Training

students' statistical thinking. In the case discussion part, students will analyze and think about how to analyze and explain the actual clinical cases to guide students with different views to communicate with each other. Broaden the scope of teaching contents of statistics course, such as: appropriately increase the content of experimental design, variance analysis and survival analysis of multi-factor experiments, and increase the selection of students' statistical methods. The knowledge provided by the textbook is no longer the content taught by teachers, but the object for students to actively construct meaning, that is, as a cognitive tool for students to actively learn and explore cooperatively.

## 5. Conclusion

Medical statistics is an essential tool course, and medical students in medical colleges and universities also have a clear understanding of how to learn, use and make good use of it. This is not only the direction of the students' efforts, but also the common efforts of teachers and teaching management workers. Compared with the traditional teaching mode, applying constructivism learning theory to medical statistics teaching can improve students' initiative, innovation and practicality in constructing medical statistics knowledge system. The combination of teaching practice will improve the teaching effect and teaching quality. Diversified teaching mode also improves students' autonomous learning ability, comprehensive application of knowledge, analysis of problems and problem-solving ability. To improve the teaching quality of medical statistics for medical students, a systematic and comprehensive reform must be carried out from the aspects of teaching materials, teaching methods, practice and examination in order to fundamentally improve the teaching effect of the course.

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