

SOME ISSUES OF CONTENT AND TEACHING METHOD OF PROBABILITY AND STATISTICS AT UNIVERSITIES OF MEDICINE AND PHARMACY

Tran Thi Thu Ha - Thai Binh University of Medicine and Pharmacy

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Abstract: In Vietnam, Probability and Statistics is a compulsory module of the curriculum at universities of medicine and pharmacy. In order to enhance the ability to apply Probability and Statistics to professional practice, the article discusses the content and teaching method of Probability and Statistics module at some universities of medicine and pharmacy. Since then, a number of measures are proposed to improve the quality of teaching Probability and Statistics at universities of medicine and pharmacy.

Keywords: Statistical and probability, students, universities of medicine and pharmacy.

1. INTRODUCTION

Probability and Statistic play a vital role in most areas, from science and technology to economics, politics, health and the environment, etc. Le Truong Giang (2007) said that *"In the Medical field, the concepts and principles of Statistics are also applied in all activities, from diagnosis to treatment, from Epidemiological survey, community diagnosis to the design and evaluation of interventions, to protect and promote the public health, while also helping us anticipate the future developments"*.

In the curriculum of the universities of medicine and pharmacy, the Probability and Statistics are grouped into a module with different names such as Probability and Statistics (Hanoi Medical University), Medical Probability and Statistics (University of Medicine and Pharmacy at Ho Chi Minh City), etc. This is a compulsory module at universities of medicine and pharmacy. The article discusses the content and teaching method of Probability and Statistics module at some universities of medicine and pharmacy. Since then, the author proposes a number of measures to improve the quality of teaching Probability and Statistics at universities of medicine and pharmacy.

2. LITERATURE REVIEW

In Vietnam, the applied mathematics, which is mainly Probability and Statistics, has officially been taught at Vietnam National University, Hanoi since 1961. In 1969, the Department of Mathematics at Hanoi National University of Education started teaching Probability and Statistics. From the school year 2006 - 2007, Probability and Statistics has been in the curriculum of high school. Currently, in most

universities and colleges, Probability and Statistics is a compulsory module of the curricula.

In the past years, many national conferences on research, application and teaching on Probability and Statistics were held in Nha Trang in 1983, Ha Tay in 2001, Ha Tay in 2005, Vinh City in 2010, Da Nang City 2015; French - Vietnamese International Conference 2013 in Ho Chi Minh City. There are many research results on the teaching of Probability and Statistics, but usually for high school students or pedagogical students.

Recently, a number of Vietnamese educators have studied the teaching and learning Probability and Statistics at universities of Medicine and Pharmacy. For example, Dao Hong Nam (2014) presents some theoretical tools of Didactic in maths; carried out a preliminary investigation of the applications of Probability and Statistics in medicine; analyzed some common errors in medical studies that use Probability and Statistics, explained the causes of errors, thereby proposed the teaching methods to test statistical hypotheses and expressed them in a teaching project. Based on the state of Probability and Statistics teaching in the Universities of Medicine and Pharmacy, Nguyen Thanh Tung (2016) proposed a system of 6 Probability and Statistics teaching methods in the Universities of Medicine and Pharmacy in the direction of increasing the use in the medical profession. The aim of the thesis is studying the application of Probability and Statistics in medicine, proposing Probability and Statistics teaching and learning methods for medical and pharmaceutical students in the direction of enhancing the application. However, these studies were conducted

before 2015, when the Ministry of Health has not yet issued the “*Basic competency standards of doctors based on professional practice capacity*”. Moreover, the Universities of Medicine and Pharmacy have not changed from the annual training system to the credit system. In particular, there have been no researches on the teaching and learning of Probability and Statistics in the direction of developing professional capacity for medical and pharmaceutical students. Below, we discuss the contents and methods of teaching Probability and Statistics module in the Universities of Medicine and Pharmacy towards developing the capacity of professional practice.

3. METHODS AND RESULTS

3.1. Status of contents and methods of teaching Probability and Statistics module in the Universities of Medicine and Pharmacy

3.1.1. For the teaching contents

In “The basic competency standards of general doctors based on professional practice capacity”, the Ministry of Health (2015) stated that the general doctors must be able to “diagnosis and treat based on evidence”; “provide logical arguments for criteria of definitive diagnostic, differential diagnosis of common diseases based on scientific evidence”; be capable of “evaluating the role of treatment and choosing the treatment”; “evaluate the effectiveness of medical interventions based on scientific evidence”; “analyze health indicators”; “explain the risk factors”; “collect, evaluate and use the reliable and valuable medical information in the country and abroad”. This document does not give a specific direction on the level, amount or content of statistical probabilities that medical students need to study but points out that doctors must carry out statistical analysis themselves.

Through the textbooks forming Probability and Statistics modules of a number of Universities of Medicine and Pharmacy such as Pham Duc Hau (2010); Dang Xuan Luu (2014) và Chu Van Tho (2016), we find that Probability and Statistics module provides the students with basic knowledge of probability and probability formulas; random variables and their distributions; random samples and sample characteristic numbers; parameter estimation; hypothesis testing and linear correlation and regression. These syllabi present the probability theory with relatively heavy assignments but ignore core knowledge such as central limit theorem

(Chu Van Tho, 2016), conditional expectation (Pham Duc Hau, 2010; Dang Xuan Luu, 2014), etc. In the textbooks, Descriptive Statistics is illustrated by problems with small sample sizes (smaller than 100), simple, classified cases. Estimation, testing the proportional values only stops at the large enough rates, not to solve the problem in the case of small probability (Pham Duc Hau, 2010), (Dang Xuan Luu, 2014)). On the Linear correlation and regression, the syllabus focuses on how to find the sample correlation coefficient and the simple linear regression model. In addition to linear regression, the medical students are not introduced to any regressions (Pham Duc Hau, 2010; Dang Xuan Luu, 2014 and Chu Van Tho, 2016). These show that the Universities of Medicine and Pharmacy have not agreed on the contents of teaching and learning.

Surveying the examples and exercises in the textbooks of a number of universities of Medicine and Pharmacy shows that the teaching contents are well illustrated (Pham Duc Hau, 2010; Dang Xuan Luu, 2014 and Chu Van Tho, 2016). The authors tried to design XSTK problems associated with realities in medical practice. However, there are still many pure mathematics. For example, in Chu Van Tho (2016), there are 34/121 (28%) of the examples and 54/122 (44%) of the exercises not related to medical contents. The problems related to medicine are quite general, less derived from reality. Medical and pharmaceutical students lack tools to practice professional skills associated with knowledge and skills of Probability and Statistics.

The development of digital technology (internet, cloud computing, data science, etc.), the explosion of medical information (protein structure, genetic data, etc.), medical science studies have shifted from empirical research to data mining. Thus, parallel to theoretical teaching, an indispensable content in Probability and Statistics teaching is to guide the students to use the statistical software. The Universities of Medicine and Pharmacy have paid attention to putting one of these softwares into teaching. A statistical software is often introduced along with many other informatics topics in Applied Informatics module, such as Epi (Thai Binh University of Medicine and Pharmacy), SPSS (Hanoi Medical University), etc.

Implementing the HPET Project (Health Professionals Education and Training for Health System

Reforms Project), a number of Universities of Medicine and Pharmacy in Vietnam have renovated the curriculum for the doctors based on their professional capacities, according to the model of Harvard Medical School, USA. However, medical schools in the United States are postgraduate schools. All the students must have at least a bachelor's degree. In other words, they all have basic scientific knowledge; therefore, there is no need for training from upper secondary level such as medical students in Vietnam. Applying this new curriculum, the teaching duration of basic science subjects, including Probability and Statistics, has reduced. Previously, most universities of Medicine and Pharmacy have regulated the duration of Probability and Statistics for General Medicine, Traditional Medicine, Odonto-Stomatology, Dentistry etc. as 3 modules (equivalent to 45 theoretical hours). At present, this duration is reduced to only 2 credits (equivalent to 30 theoretical hours). Because of the limited time, the lecturers are less likely to be able to select more contents, interpret the problems logically, or make more applications of Probability and Statistics in the medical field.

3.1.2. For teaching methods

When using traditional teaching methods, lecturers often focus on communicating knowledge, aiming at goals, helping students understand and remember knowledge. This method is less focused on developing thinking, training soft skills, leading to the situation that most students passive learning and graduation does not meet the job requirements well. This restriction poses an urgent need to innovate teaching methods, attracting more students to participate in the teaching process. A trend of innovating teaching methods being applied at medical universities is to train professional capacity for students.

In appearance, the reduced class time is offset by increasing self-study time of student. In essence, training methods based on credits take learners as the center in the process of teaching and learning, promoting the activeness and creativity of learners. In the mode of credit training, self-study, self-research of students are respected, calculated into the contents and duration of the program. In the traditional training, the role of the instructor is valued (instructor-centered). In contrast, in the mode of credit training, the role of the learner is particularly valued (learner-centered). To succeed in credit training, the lecturers have to innovate

the teaching methods, helping the learners move from passive learning to active learning. In addition to the traditional teaching methods, the lecturers have combined many positive teaching methods. According to Svetlana Tishkovskaya & Gillian A. Lancaster (2012), some of the positive teaching methods used in Probability and Statistics teaching are Collaborative learning, Problem-based learning, Project-based learning, Case study, Simulation, and technology usage, etc. Applying positive methods in teaching Probability and Statistics for the medical students shows some unreasonable problems:

- Probability and Statistics is usually taught in the first or second year when most students are not equipped with significant knowledge about the medical. The number of students in one class are big. For example, in Thai Binh University of Medicine and Pharmacy in the academic year of 2018-2019, the number of students per medical class in the first year is about 80 students. It is difficult for the lecturers to teach through a variety of learning activities such as discussion, group study, huge assignments, etc.

- To inspire the students to learn, the lecturers need to address the practical issues, led by specialized information, to guide the students to look for the knowledge they have learned to understand the problems and find solutions. When teaching, the lecturers often present practical simulation problems, lack of assignments, topics for students to self-study, study in groups or discuss. As a result, teaching is less associated with practice, less on the basis of professional practice.

- The rapid development of the Evidence-Based Medicine movement, of the statistical software, of the internet makes medical personnel easy to access research materials. However, many statistical lecturers have not yet caught up with this trend; they have not exploited information technology in teaching Probability and Statistics, making lectures less vivid and intuitive.

- In the curricula of Universities of Medicine and Pharmacy, the Probability and Statistics module can be integrated into two modules: Applied Informatics and Scientific Research. However, in the general doctors' curriculum based on professional practice capacity currently used, all three modules are independent. Therefore, in our opinion, this is also a difficulty for

lecturers when teaching Probability and Statistics at Universities of Medicine and Pharmacy.

3.2. Some recommendations

In order to improve the quality of Probability and Statistics teaching in the universities of Medicine and Pharmacy in a way that contributes to the development of professional capacity, in our opinion it is necessary to:

- Train the lecturers who teach Probability and Statistics in the universities of Medicine and Pharmacy for improving the interdisciplinary knowledge. Instruct them to use proficiently a statistical software. Facilitate them to participate in medical research and solving practical problems.

- Boost examples, exercises associated with specialized practice when compiling the subject textbooks.

- Integrate the Probability and Statistics contents into other course contents, especially those related to clinical practice and scientific research, to help the students become aware of Probability and Statistics involved in clinical practice.

- Combine many positive teaching methods. Strengthen the guidance of statistical techniques in the direction of combining with technology and statistical software.

4. DISCUSSION AND CONCLUSION

Probability and Statistics is an important module in the curriculum of the Universities of Medicine and Pharmacy. Along with the strong development of science and technology, it requires the Universities of Medicine and Pharmacy to develop the subject training programs increasingly towards application, efficiency. In teaching Probability and Statistics at Universities of Medicine and Pharmacy, lecturers need to innovate teaching methods, apply new technologies and always seek to develop lectures attached to practice to help students become more excited and proactive in learning and scientific research.

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