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Peculiarities of Teaching Medical Informatics and Statistics

Abstract

The article reviews features of teaching Medical Informatics and Statistics. The course is referred to the disciplines of Mathematical and Natural sciences. The course is provided in all the faculties of I. M. Sechenov First Moscow State Medical University. For students of Preventive Medicine Department the time frame allotted for studying the course is significantly larger than for similar course provided at other faculties. To improve the teaching methodology of the discipline an analysis of the curriculum has been carried out, attendance and students' performance statistics have been summarized. As a result, the main goals and objectives have been identified. Besides, general educational functions and the contribution to the solution of problems of education, students' upbringing and development have been revealed; two stages of teaching have been presented. Recommendations referred to the newest methodological development aimed at improving the quality of teaching the discipline are provided. The ways of improving the methods and organizational forms of education are outlined.

Keywords: education, Medical Informatics, Medical Statistics, information technology, methods and organizational forms of education

Introduction

The implementation of information technologies and statistical research techniques made it possible to conquer the existing contradictions between the amount of medical data and the possibility of its full-fledged analysis in modern medical science and in practice.

The current teaching practice of "Medical Informatics and Statistics" at universities shows that the majority of junior students start studying the discipline with no basic knowledge. The professional orientation of schoolchildren and those who study at specialized secondary educational establishments – future Medical schools students – doesn't include subsequent knowledge deepening: from basic-level to high-level teaching. This leads to lower students' performance, on the one hand, and shows the negative trend of misunderstanding and, as a result, inefficient use of information technology and statistical processing that is considered as a tool for scientific management of research results. These results are required by senior and graduate students or those students who study in residency.

Another methodological omission of Russian Medical schools is that there is no unified teaching program for the discipline, which, in its turn, is taught at different departments: biophysics, public health, information technology, and many others being a separate course. The fragmentation of the material leads to its dissolution in the content of other courses, little subject retention, non-participation in students' competence establishment concerning Medical Informatics.

Methodological framework of the course

The main aim of the subject is to develop a comprehensive vision of modern information technology and skills of using the most efficient and widely spread ones in practice. Another goal is to make students aware of the role of statistics in modern society, its influence on the current state and the development of science and technology, and the development and distribution of information technology.

Practical mastering of using efficient computer technology and special programs is a part of the course that teaches students to actively and productively use information technology in studying other disciplines.

Primary goals of the subject:

- to acquaint students with the main devices of a modern computer;
- to master practical skills of working with a PC;
- to master the skills of algorithmization and planning of problem solution;
- to create a vision of modern computer graphics and its implementation in various fields of human activity, to acquaint students with basic concepts and methods of using a certain pack of computer graphics in practice;
- to create a vision of modern integrated systems and their usage in various fields of human activity;
- to create a vision of information technology being a system of hardware and software tools and methods of using them;
- to clarify the role of information technology and the perspectives of its development for modern society.

The discipline “Medical Informatics and Statistics” provides students not only with the newest information processing toolkit, but also with a range of methods of using the toolkit in studying and analyzing the phenomena, objects and systems.

It is clear that the subject could not be studied separated from other disciplines. It must be adapted to the changes in the contents, teaching forms and methods of other disciplines. These changes are required to reflect the influence of information technologies on modern science, technology and all spheres of social life.

The content of the discipline includes a complex of interconnected components: theoretical and practical (Gerasimov, 2008).

Theoretical part of the course is aimed at developing the skills of analyzing objective problems and of algorithmic culture.

Practical aspect is devoted to acquiring the skills of working with the ready-made software. The need to develop the skills of dealing with an electronic computer includes significant increase in the amount of practice exercises (in comparison with other disciplines) in the overall structure of the course. This differentiates the discipline from the others.

It is essential to point out the main educational functions of the subject, its impact on the process of solving educational problems and of students’ upbringing and development.

The worldview function of the course. The function lies in clarifying the role of information processes (transfer, convert, store, etc.) for wildlife, technology, society; the importance of informatics and computing technology for the improvement of production efficiency, the change in the nature of work. One should admit that this function is not yet sufficiently implemented.

The educational function of the discipline deals with the issue of developing the skills of using computing equipment as a special tool of reaching educational objectives.

Dividing the aims into two large groups, referred to the development of the discipline and acquainting students with the basics of Informatics as a fundamental science, leads to a *two-staged* teaching structure.

The first stage is devoted to mastering the applications of Informatics and Statistics and is aimed at reaching a certain level that allows the subsequent wide use of obtained knowledge and skills.

The second stage is devoted to studying the basics of Informatics and Statistics as a fundamental branch of science and is foremost connected with shaping students' scientific worldview.

Improvement of methods and organizational forms of teaching

Talking about the improvement of methods and organizational forms of teaching, the key objective is to bridge the gap between theoretical and practical aspects of the course.

The most important issue is the one connected with choosing organizational forms of running the classes. Analyzing the nature of activities of those who are engaged in Informatics shows that a collective type of activity dominates here. Considering that it is important not only to give students certain knowledge and competencies but also some teamwork skills, such forms of teaching like seminars, workshops and debates should be widely used. Besides, collective activities like preparing an abstract, a report, carrying out a modeling experiment, preparing materials for other disciplines and others should be implemented. These forms can provide better subject retention, development of students' autonomy and willingness of being more active.

However, one shouldn't treat computer literacy only as the interaction with a computer on different levels. The key aim of the course is to develop the students' structural way of thinking. Therefore, a significant problem here lies in analyzing the relations between the course of Informatics and other disciplines of the program and, thus, in identifying the spheres of its application.

It is essential to develop *additions and clarifications* for the curricula of almost all the disciplines taking into account the potential of modern information technology and its development perspectives.

The education should be based on the *skills of finding* the necessary data and *working* with various databases, most notably with the ones in the Internet. This will help to avoid memorizing extensive, but later unnecessary knowledge (Glushkov et al., 2015).

A computer should be treated as a *learning tool*, but not as a subject of learning.

Teaching Informatics and Computing technology at universities

Considering the experience, it is recommended to study Informatics and Computing technology at universities in the following way:

- start from computer drawing, mastering the basic graphics software;

- learn the simplest tools of working with texts, master text editing software and the basics of text layout;
- master transforming the office software into a single process (texts, graphics and spreadsheets);
- study the basics of telecommunication technology (working with the local network, Internet);
- study the basics of algorithmization and programming in a modern high-level language.

Therefore, in the future it is necessary to pay more attention to using computer technology in practice and improving the intellectual level of students while studying the Informatics and Computing technology.

Studying mathematical statistics is based on using certain knowledge of mathematics as well as the following toolkit: Microsoft Excel, SPSS (PASW), and etc. Thus, there is no doubt that lack of study hours devoted to this particular discipline at universities leads to significant problems. Students' answers, such as "I do not know why this is necessary", show that they have no motivation to study the course during the first semester, this is particularly true in the case of mathematical statistics (Gerasimov, 2007).

The probability theory and mathematical statistics – is an obligatory subject that is included in the educational standards of the new generation for technical and humanitarian specializations. The discipline occupies a unique position among other branches of natural science. Its importance and relevance are reflected not only in skilled use of theoretical and probabilistic methods and ideas in professional field. It is also reflected in wide impact on the cognitive area: from establishing a modern way of thinking to thorough understanding of complex systems and modern conceptual vision of the world.

During the process of education it is important to pay certain attention to the inter-subject relations, in particular, between mathematical statistics and the Faculty of Preventive Medicine, Medicine and Pediatrics, where the knowledge of mathematics plays a significant role.

Underestimation of the role of this discipline by students may be connected with the fact that for junior students the role of mathematics and mathematical statistics in medicine is not obvious. Junior students are not interested in learning the material as they don't understand that it helps them to model, analyze and reach the professional goals.

Despite the increasing number of students the rate of their attendance decreases and now reaches 15%. Looking at elective courses the parameter equals 75% at the fourth year and lowers among sixth-year students. At the same time the number of students who do not attend extra classes rises.

These knowledge gaps hinder the teaching process, lower the motivation of getting new knowledge. Professors have to be patient and use their experience to regain the balance of students' knowledge as soon as possible by closing the existing gaps. One of the ways out is to develop special websites and electronic versions of textbooks and manuals.

By all means, that is not a question of total refusal of manual computing. It is more efficient to start using information technology after learning the basics of traditional ways of calculating. This greatly facilitates and speeds up the process of

computing, giving an opportunity to carry out much more complicated calculating later on that is connected with future occupational activities of the students.

Conclusion

The “Medical Informatics and Statistics” discipline is one of the core and relevant subjects for students who choose a medical profession. It will help the future doctors to feel at ease in the world of constantly developing information technology, medical data systems and statistical analysis of clinical data.

While studying the course particular attention should be paid to the methods of computer data processing, to forming databases and knowledge-bases, using Internet-resources, to the implementation of computer technologies in practice, that lead to the increase in intellectual knowledge of the students.

To improve the quality of education in the field of modern information technology in medicine it is necessary to develop a strategy of teaching students of different educational levels based on succession. This program will be implemented within the Resource-center called “Sechenov Medical Preparatory Department”. Moreover, it is important to use the practice of elective courses, broaden the outlook of the students with the help of conferences on medical informatics.

Constant monitoring and improvement of logistic support should be provided.

Moreover, it is essential to carry out close cooperation with employers as a young specialist’s performance will be significantly higher in case his/her future workplace is provided with high-level technical equipment.

References

- Gerasimov, A. N (2008): *Medical Informatics. A textbook with an attached CD with training courses*. Moscow: MIA.
- Gerasimov, A. N. (2007): *Medical Statistics. Tutorial*. Moscow: MIA.
- Glushkov, S. V., Ishechkin, B. B. & Ishechkin, V. B. (2015): Features of application of general-purpose computer technology for teaching students at military departments of medical universities. *Development of science and education in the modern world: Collection of scientific papers in 6 parts*. Part IV. Moscow: AR-Consult.

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