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TECHNOLOGIES FOR SCIENTIFIC RESEARCH CONDUCTION

SUMMARY

This article focuses on main problems that young scientists face while preparing final qualification works in the system of postgraduate education. Different variants of technological approaches for determining the research topic and authoring ways of solving scientific problems are determined. Several opportunities for the choice of technology, preparation and presentation of scientific research topics while writing medical and biological theses on the magistracy and doctoral studies are considered. Criteria for scientific knowledge evaluation, ways of effective organization of research the, typical examples of errors and stereotyped opinions during the preparation of dissertations are described.

Key words: methods and technologies of organization of scientific activity, final qualification works, methodology of dissertational research, master and doctoral scientific works.

The methodology of science and organization of scientific activity is based on proven and traditional technological methods. Certain rules of academic style should be followed when writing a scientific letter and references citation, participation in written and oral discussions, speeches at round tables, conferences, a scholar and a dissertational council [1]. Proper research organization represents the most challenging issue for the young scientist. Professor V.N. Yarskaya claims in "Methodology of dissertational research" that the general methodological culture, theoretical knowledge, basic education and life experience of the young scientist are not significant. She considers it necessary to use the past experience of young scientists in the context of the methodology of the selected topic for the replenishment of scientific baggage, and that otherwise even a fundamental education can be a barrier in the development of research methodologies [1]. The experience of leading countries, in particular the United States showed that for every \$ 1 invested into R&D it comes as 9\$ growth outcome in GDP growth [2]. Research in the field of scientific management, organization and planning is mainly aimed at improving the management of scientific activities.

One should be guided by the general principles of methodology of scientific research while conducting research in any field of medicine [3-6]. First of all, proper clinical trials should be based on the principles of "Good Clinical Practice". But, most often, the experimental work is methodologically verified, and most clinical studies do not have a clearly defined aim, inclusion and exclusion criteria, adequate design, and are adjusted in the course of the work, being oriented toward obtaining a positive result. The majority of conclusions in scientific publications being based on theoretical speculations and have no practical evidence behind [8]. The number of well-planned randomized clinical trials is minimized, data with negative results are not published anywhere. In Russia, this process of falsification of a significant part of published works with unreliable data devoted to the problems of medicine results in disinformation of practical health care specialists leading to the reduction of the clinical value of many therapeutic methods. According to Vlasov, this leads to the lack of a scientific basis for evidence based medicine as well as it undermines the policy of the practical health care system [6]. At present time, most of the research with statistical computations is

conducted by specialists with technical education, while the publications by scientists with medical and biological education are based on the Student's test statistics [7]. In addition, the interpretation of the obtained data is very distant from the reality, ie practically inapplicable in clinical conditions. Most clinical trials have been conducted to identify a statistically significant difference between the control and the experimental group after the treatment, thus significance is extremely low and false, it is proposed to apply approaches based on the effectiveness of therapeutic interventions.

Formulation and organization of this kind of scientific research is ineffective and useless. Canadian scientists D. Sacket, B.Haynes, G.Guyatt, P.Tugwell suggested the most rational and reasonable decision such as applying methods of clinical epidemiology, which underlie fundamentals of evidence-based medicine.

All methods applied in preclinical and clinical research studies should be reproducible, specific, meet international standards and be up-to-date. Usually, when allocating funding grants on research, at least 10 % of the budget should be allocated on new methods approbation, analysis, summarization of the results obtained and publications in foreign databases and at least 25 % of funds should be allocated for practical health care. Any scientific research should include such processes: as the choice and justification of the topic; informational search for five years or more; the conclusion of a local ethical committee on the research project; public speech in front of other scientists of the department (laboratory) with the justification of the chosen topic. The following stages of scientific research: the research planning, comprehension, interpretation, generalization and description of the obtained data in forms of publications, patents, methodological recommendations and the introduction of acquired knowledge into practical health care system.

Therefore, for a rational construction of research it is required to have a certain set of knowledge on research processes and the implementation methodology. The main technology is a linear technology, including the sequential execution of research stages, the formulation of goals and objectives for its solution, the choice of research methods, analysis and the search for positive solutions, experimental verification of solutions and the development of innovations. However, when conducting a research project,

obstacles, difficulties, and problems may arise, for the solution of which one sometimes has to return to the previous stage to correct mistakes that has arisen. Probably, the problem was determined superficially or unilaterally, so it became necessary to re-consider it from another viewpoint. For example, the researcher suddenly realized that the scheme of the conducted research will contradict with future expected results and he is forced to start re-planning. This type of research was called - a cyclic study, characterized by a return to the passed stages to ensure the reliability of the results.

When planning one general complex task, there is a possibility to envisage conducting parallel studies on the same object using a number of different methods, which in turn reduces a number of costs: financial, time and material. In addition, there is a technology for branching out activities, separating the aspects of the problem depending on the methods or functions of its solution, carrying out identical but parallel studies in relation to same problems types. If there are problems in the study, where the solution represents a difficult task in a predefined technological scheme, the technology of adaptive type – sequential adjustment of the technological scheme is applied. Every stage is evaluated by the results, and that evaluations are necessary to determine a new stage.

There is also a technology of a random search. At the first stage of such technology, any problem is taken and, starting from it, adjacent issues are investigated, connections are identified, a development trajectory is determined on this basis, which in turn reveals the main problem under the investigation.

Thesis as a scientific work is very specific, in the system of science it performs a qualifying function, i.e. it is being prepared for the public viva and obtaining a scientific degree. Therefore, the author's main aim is to main show the level of his/her scientific qualification, the ability to do a scientific search and solve specific scientific problems [9]. Focusing on the readers with high professional training, the author applies all the signage apparatus available at the disposal (tables, diagrams, charts, graphs), everything that makes up the "language of science" only to specialists. There are strong arguments in favor of the chosen concept, comprehensively analyzed and demonstrably criticized opposing points of view. This reflects the property of scientific knowledge, such as criticality in relation to existing views and

ideas, since the content of the dissertation underlies the discussion of debatable and polemic issues.

The master's and doctoral theses has principal differences. Master's degree is essentially the first step to scientific research and scientific-pedagogical activity; moreover, the master's thesis cannot be considered as reliable scientific work, since the master's degree is not a scientific but an academic degree. It reflects the educational level of a graduate of higher education and attests to the skills and abilities inherent to a beginning scientist. The main task of the master's work is to demonstrate the level of the qualification, the ability to do scientific search and solve specific scientific problems. This work is done with the purpose to systematize and expand theoretical and practical knowledge on the chosen direction, its application while solving concrete practical problems; demonstration of skills to work independently; generalization and logical presentation of the material. This work in general should indicate the author's ability to perform scientific work in the chosen field of professional activity [10]. Scientific solutions within the master's thesis writing should reflect training program. The performance of the master's rather reflects as evidence that the author has learned to conduct a scientific search independently, see professional problems and know the general solution methods [11].

In addition, the content of the work can include results of theoretical and experimental research, development of new methodological techniques and methods for solving scientific problems as well as their theoretical justification. The work cannot be only literature-based nor have compilation nature [12].

A few master's studies are aimed at the development of scientific positions put forward by a particular scientific school. The themes of such master's works can be very specific, which in turn does not detract their actuality. The purpose of such works is to solve particular issues within the framework of a sufficiently proven concept. Thus, the relevance of such scientific works in general should be assessed in terms of the conceptual orientation that the graduate adheres to, or the scientific contribution made by this particular research work to the development of a general concept.

Doctoral dissertation is a qualifying scientific work on a certain specialty of the educational program that prepares either a doctor of philosophy (PhD) or doctor by profile. The thesis must meet one of the following requirements:

- have new scientifically validated results that solve an important practical problem;
- contain results, that should underlie solutions of an important applied problem;
- contain new scientifically grounded theoretical and (or) experimental results, the totality of which is important for the development of specific scientific areas [10].

From the scientific point of view, the thesis introduces new concepts and facts into scientific application. The author's concept adequately reflects the problem situation in science and corresponds to this direction of scientific knowledge. Only in this case such a concept is recognized as being consistent in the scientific sense and provides an increase in scientific knowledge [13]. There exist main causes for the failure of dissertational research and in the subsequent failure of defense of dissertations. These include no ongoing monitoring by research tutors; wrong choice of the research topic; non-compliance with the purpose and objectives of the study, insufficiency of materials, experimental data, a particular study subject; incorrect or incomplete interpretation of the results; use of incorrect and inappropriate methods of analysis; incomplete or non-critical review of the preceding material; inability to identify the main provisions, facts, results; incorrect conclusions; the presence of errors in approbation of the results of the study; poor presentation skills; formal preliminary examination of the thesis at the department; wrong thesis defense strategy.

Therefore, the competitor, in conditions of limited time, possessing required skills with a clear formulation of the characteristics of the final qualifying work, methods of scientific analysis and presentation of profoundly justified results, requires constant monitoring and work corrections. In this case, proper detailed organization of the dissertation work by the advisor will allow the candidate to choose the topic of research work correctly, analyze the state of the objects, and suggest an optimal solution to the problem.

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АННОТАЦИЯ

Показаны проблемы, с которыми встречаются молодые ученые при подготовке выпускных квалификационных работ в системе послевузовского образования. Определены различные варианты технологичных подходов для определения темы исследования и авторских путей решения научных проблем. Рассмотрены варианты выбора технологии, подготовки и изложения темы научного исследования при написании диссертации в магистратуре и докторантуре медико-биологического направления. Представлены критерии научности знаний, способы эффективной организации научного исследования, типичные примеры ошибок и стереотипных мнений при подготовке диссертационной работы.

Ключевые слова: методы и технологии организации научной деятельности, выпускные квалификационные работы, методология диссертационного исследования, магистерские и докторские научные работы.

ТҮЙІН

Мақалада жоғары оқу орнынан кейінгі жүйедегі жас ғалымдардың диссертациялық жұмыстарды дайындау барысындағы кездесетін мәселелер көрсетілген және біліктілік жұмысын дайындаудың тәжірибесі жинақталған. Зерттелетін тақырыпты негіздеу үшін технологиялық жолдар және автордың ғылыми мәселені шешуінің әртүрлі нұсқалары көрсетілген. Медицина-биологиялық бағыттағы докторантура мен магистратура диссертациялық жұмыстарын дайындау кезіндегі ғылыми зерттеу тақырыбын таңдау, мазмұндау және дайындау технологиясының нұсқалары көрсетілген. Білімнің ғылымилық критерийлері, ғылыми зерттеуді ұйымдастырудың тиімді және тиімді емес жолдары берілген, диссертациялық жұмысты дайындаудағы типтік қателіктер мен стереотипті ойларға мысалдар келтірілген. Берілген жағдайларды сауатты басқару диссертанттарға зерттелетін тақырыпты ғылыми негіздеуге, зерттеу объектісінің күйін талдауға, мәселенің шешу жолдарын анықтауға және зерттелетін объектіні дамытуға мүмкіндік береді.

Түйінді сөздер: ғылыми қызметті ұйымдастырудың технологиялары мен әдістері, диссертациялық жұмыстың методологиясы, соңғы біліктілік жұмыстары, магистрлік және докторлық ғылыми жұмыстар.