

# Professionally Significant Interdisciplinary Connections in the Course "History and Philosophy of Science" for Postgraduate Students of Medical Universities

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## Abstract

The article proposes and methodically reveals the idea of strengthening professionally important inter-subject relations in the process of studying the post-graduate course "History and Philosophy of Science". The review is focused on the training of postgraduate students of medical universities; interdisciplinary connections are reflected in the triad "General scientific methodology – Medicine – Pedagogy", which is based on the three components of the training of postgraduate-clinician: medical and diagnostic practical activities; research activities in the field of medicine; practical and research activities in the field of higher education. In this context, such components of the training course as objective and scientific-subject reality, scientific fact, its identification and instrumental-theoretical interpretation are considered.

**Keywords:** instrumental and theoretical interpretation of the fact, interdisciplinary connections, history and philosophy of science, medical and pedagogical scientific fact, method of expert assessment, objective and scientific-subject reality.

## INTRODUCTION

Today, in the system of higher education in many countries of Europe and Asia, graduate school becomes the third, highest level of professional education. Some study courses have a multifunctional role: they are considered as the basis for preparing a student for the candidate's minimum exam (I), as a reference point in future research activities (II), as a promise for future practical teaching and research activities in the field of pedagogy and education (III). This arrangement of three positions, in the authors' view, reflects the problem in the segment of the professional importance of various aspects of the content of education offered by an institution for graduate school students. The first component (I) seems to be the most important, the second one (II) is considered as desirable, and third one has the status of optional, possible (III) component.

To the above-mentioned training courses, we can rightly attribute the course "History and Philosophy of Science", included in the structure of the candidate's minimum of medical and pharmaceutical specialties. The authors believe it is possible to focus on the interdisciplinary relations of the newly identified three positions of educational importance in its content and, based on the declared triad, they see these relations as a manifestation of the idea of combining general scientific research methodology and the specific scientific one, including the field of medicine (pharmacy) and pedagogy in the training course. The latter reflects component (III) and may well be one of the components of future professional activity.

In this regard, the authors consider it possible to declare the construction of such content of the course "History and Philosophy of Science" for postgraduate medical students, which could include the above-mentioned interdisciplinary connections as a scientific problem. Today, this traditional course's format includes only the first component (I) and loses a lot from the standpoint of practical significance.

## MATERIALS AND METHODS

In the process of work the authors used: 1) segment analysis of educational practice; 2) ontogenetic and retrospective analysis of the problem using the archived sources of pedagogical direction, normative documents related to training in postgraduate medical and pharmaceutical profile and the order of dissertations for the degree of Candidate of Sciences; 3) analysis of the possibilities of projection of the problem in the philosophical and methodological format and the subsequent ascent to the specific one; 4) the hypothesis associated with the content and modification of traditional educational content in connection with

the idea of reflecting interdisciplinarity; 5) the method of expert assessments and analysis of the results of the pilot implementation of the modified content in the practice of education.

## LITERATURE REVIEW

Analyzing the content of the course "History and Philosophy of Science", the authors used a fairly representative array of publications of Russian and foreign authors. The component of this course, related to logic, is described in detail in the works of Russian [1-5] and foreign [6-9] authors. The course component that is associated with gnoseology, is disclosed in the works of foreign authors B. Barczyński [10], M. Baxter Magolda [6], G. Gardiner [11], H. Koskinen [12], D. Pritchard [13], T. Shirish [14] and a number of others. Some foreign researchers represent the possibility of the orientation of the logical-epistemological material of history and philosophy of science in the philosophy of education and medicine. This is reflected in the works of W. Brezinka [15], C. Coney [16], J. Shepperd [8], N. Snaza [17], T. Leś [18], C. Anderson [19], D. Lundie [20].

Despite the importance of the results presented in the literature, the authors believe it is possible to assert that the course "History and Philosophy of Science" is impractically separated both from the professional activity of the future graduate of the medical profile, as a whole, and from such components as medical research and pedagogical research projects. That is why the search for ways of their combination in one training course is believed to be an important issue.

## RESULTS

Let us present the above-mentioned hypothetical content of the traditional course "History and Philosophy of Science" for graduate students, based on the idea of interdisciplinarity, relevant for students of the medical and pharmaceutical profile and including the general scientific level of the methodology of knowledge and the specific scientific one (pedagogy – medicine).

The authors will start with the idea of a correlation between objective and subject-scientific reality traditionally included in the discussed postgraduate course. The traditional content of this topic states that even in the humanities of the weak gnoseological version, the contemplative, purely descriptive representation of the objective reality built up from the researcher does not correspond to the current state of the humanitarian scientific methodology. Objective reality, one way or another, in the process of scientific analysis is transformed into a subject-scientific reality, involving the construction of model objects and processes that are convenient for further research, obtaining new

scientific knowledge or modifying known knowledge, the use of special procedures – methods of scientific research, their application to model descriptions of reality and comparison of the results obtained theoretically with the experimental ones.

In the process of teaching, the authors note to the students that this topic has long been discussed in relation to natural sciences and psychology, which is revealed, in particular, from the analysis of the works of M. B. Sapunov and S. S. Rozova [21, 22], the conclusions of which are recommended to be applied to postgraduate students. In the status of the general approach to the designation and solution of the problem, the authors also draw the attention of students to the work of V. V. Zuev [23], which raises the question of the dialectic of the naturalistic and socio-cultural approach: the first one is focused on the thesis that the world of objects of knowledge is independent of a person as the subject of knowledge, the second one – that the world of objects of knowledge is constantly being completed by a person himself/herself in the process of acquiring knowledge by presenting the studied fragment of objective reality by means of a specific science. Further, Zuev continues his idea by the conclusion that the analysis of the relationship between the two approaches (the first one reflects the idea of classical science, the second one – non-classical and partially post-non-classical science) determines the need to oppose the objective reality to the subject reality of science. The latter is discussed in detail, for example, in the early works of M. B. Sapunov [21] in relation to biology, which is the theoretical basis of medicine. In the first approximation, medical subject-scientific reality differs from reality by objective *separation*: a) *a medical event* at the level of a patient's sensation of any pain, instability of his/her condition, it's dissimilarity with the usual physiological state, deviations from the adequately perceived and b) *medical scientific fact* as an expression of a particular reference to the event format, including CLICHÉ: "the body as an object of medical and physiological research", "indicators of physiological norm and deviations from it", "classification of the observed deviation to a particular known type of pathology", "the method of medical research based on the synthesis of chemistry, physics, biology, physiology", "model of the treatment and diagnostic process" and others.

It was noted above that the postgraduate students are guided (as one of the possible options) in the pedagogical direction of future activities in medical universities and therefore in the process of studying the course "History and Philosophy of Science" it is important to orient all the discussed content on pedagogy.

Adapting the presented conclusions to pedagogical science, the authors follow Sapunov to note that in the last 30 years, teachers-researchers and practitioners have faced the fact of the existence of alternative theoretical schemes, views, concepts, prescribing pedagogical reality the different systems of "ideal objects". This clearly shows the complex and highly ambiguous relationship between scientific knowledge and the empirical world of the pedagogical field. At the same time, the authors agree that the concepts of contemplative reflection of reality by scientists no longer correspond to today's vision of the methodology of pedagogy. The methodological analysis conducted in the work by Baxter M. [6], absolutely reasonably arises the question of introducing the differences between the objective and the scientific-subject pedagogical reality. This reality can be described as achieved in the process of scientific and pedagogical treatment of the selected segment of the pedagogical reality. This treatment consists in the scientific "processing" of the pedagogical segment in order to give it a form convenient for research, the purpose of which is to obtain a new, previously unknown knowledge, or to modify the existing knowledge of the insufficient degree of logical-content alignment or generality. A similar process is described in the cited articles by C. Coney and

D. Lundie [16, 24], as well as such foreign researchers as P. Alexander [25], B. Barczyński [10], W. Brezinka [15], G. Gardiner [11], H. Koskinen [12], H. Letiche [26], B. Mallaband [27], D. Pritchard [13].

Let us try to determine the difference between the objective reality and the medical and pedagogical subject-scientific one. First, the difference is in the presence in the latter of ideal (idealized) objects, which will be discussed in detail below. Secondly, the objective reality is filled with pedagogical and medical events, and the second one – with scientific facts that lead the researcher to the formulation of a scientific problem, which, in turn, leads to the formulation of the scientific hypothesis, based on the revealed scientific facts, uses their model description by means of "inclusion" in the course of the model-presented pedagogical and medical diagnostic processes; the obtained model result is "transferred" by means of practical approbation to pedagogical and medical validity and the diagnosed results allow to reveal the degree of adequacy of the model description offered by a researcher to the results found in such transfer. Finally, third, the subject-scientific pedagogical and medical reality is inevitably encrusted with general methodological regulations of scientific research, private scientific principles arising from them, as well as specific "rules" of scientific activity, in particular, the rules of research interaction and scientific dialogue.

The authors connect with the scientific-subject reality, first of all, the possibility to position the phenomenon of "*pedagogical and medical scientific fact*", mainly because the description of this phenomenon in the sources (J. Shepperd [8], T. Leś [18], J. Wettersten [28], C. Anderson [19], N. Bauer [29], T. Shirish [14]) demonstrates a strong polyphony. In modern science, the problem of correlation between fact and theory is especially highlighted. One of the extreme forms of its solution is methodological factualism, which takes as the basis the independence of scientific fact from the theory. The opposite concept, called theorism in science, preaches an organic, immanent embeddedness of facts in the structure of the theory. Finding the middle ground between the two given extreme points of view is an actual problem of both science in general, and medicine and pedagogy in particular. The latter should be discussed in detail, implementing in the content of the course "History and Philosophy of Science" interdisciplinary connections of medicine and pedagogy.

First, pedagogical facts should be classified as singular and have a particular degree of prevalence in educational reality: the non-development of knowledge can be recorded as singular, found in a particular student, and mass, found in some kind of statistical sample. Further pedagogical recording of the "mass" facts is advisable, in the authors' opinion, to conduct similarly to the proposed by I. Kant in "Critique of pure reason": "...in the construction of conclusions, the mind seeks to reduce the great diversity of knowledge to the smallest number of principles and thus achieve the highest of their unity..." [21]. The marked analogy sounds as follows: when denoting a particular pedagogical fact, the recorded in the educational reality *set* of manifestations (qualities of a student, the degree of possession of certain educational skills, etc.), it is expedient to use the *smallest number* of typological designations expressed by means of terms of pedagogical and medical science and terms from related fields of knowledge. For example, various errors made by medical students in solving problems in genetics, are typed and coded by a researcher stylistically as the inability to carry out certain mental operations, to apply analysis, synthesis, generalization, formulating consequences, etc.

At the same time, for pedagogy, such a scheme of revealing a scientific fact, in which the first step of is to fix objectively the present event(s) of pedagogical reality and the

second one – the language presentation of this event with attempts to typify the tracked events, to unite them in groups, classes on one or another basis is quite applicable. The described stage is similar for a scientific medical fact with the difference that the symptoms detected by the diagnostician are classified and typified, indicating a certain deviation of a patient's condition from the norm; then the qualitative and quantitative degree of their manifestation is attributed to the language-designated one or another preliminary diagnosis. This stage may well be presented as a fixation of what claims the status of medical scientific fact, however, the process of establishing the fact cannot be considered complete.

The third step in the identification of a pedagogical scientific fact is, in the authors' opinion, the use of tools applied for verifying the claim for a scientific fact statement. In the example discussed above, such tools could include special diagnostic tests, including checking the students' ability to carry out actions related to the solution of genetics problems, the unformed nature of which are suspected in the students by the teacher-researcher, fixing this fact. A similar step in the identification of a medical scientific fact is the designation of medical diagnostic tools, features of their application for identifying the parameters that develop into a preliminary diagnosis, which includes, in most cases, the necessary prediagnostic preparation of the patient for examination. If such preparation is not sufficient or the initial diagnosis raises reasonable doubts, for example, due to the impact on the measuring device of various random factors, all or some instrumental procedures are repeated, the initial diagnosis is either confirmed or clarified and supplemented.

The results of the diagnosis discussed in some cases allow to confirm the initial assumption of the researcher, and more often to supplement it, for example, with the manifestation of additional operations, actions that students who solve problems in genetics are not able to competently carry out. However, it is necessary to remember about such situations when a number of operations that "on initial suspicion", which students were unable to perform, in fact, do not show wide dissemination and require analysis only at the level of individual manifestation. It is clear that, depending on the results of the diagnosis, the scientific fact proposed by the researcher-teacher is either confirmed or refuted or supplemented in some part. For a scientific medical fact, the results of the patient's diagnosis also sometimes allow to confirm the initial hypothetical assumption of the doctor about the diagnosis and to supplement it with various clarifying codes.

The fourth step in the identification of both pedagogical and medical facts is the use of theoretical tools by the researcher to detect the discussed fact and their interpretation. This thesis automatically shows the authors' position on the theoretical "loading" of pedagogical facts in the logic of the dyad

"factualism-theorism": they tend to recognize the *close connection* of facts with pedagogical or medical theory as an objective reality. In their opinion, this *connection* for the pedagogical fact is manifested in the first approximation in the formulation of this fact in the language of the theory of pedagogy: the example of general biology is possible as interpreted through such categories as "cognitive barrier", "unformed mental ability", "lack of prior experience of the student to solve the educational problem", "underdeveloped skills of applying theoretical knowledge in practice" and others. A similar statement is true for a medical scientific fact.

The connection of pedagogical fact with the theory is also manifested at the level of consistency/inconsistency of this fact with certain provisions and conclusions of the theory. In the above-mentioned example from genetics, the fact of students' undeveloped specific skills can be agreed, for example, with the known theory of gradual formation of mental actions (P. Ya. Galperin, Galperin, N.F. Talyzina and students): the hope for the successful formation of students' skills to solve problems of genetics in a spontaneous format, without the allocation by the teacher of logically related stages of development of complex mental skills and the inclusion of students in the phased activity of their development, theoretically grounded and multiple supported by educational practice, is in vain. It is possible that this leads to a pedagogical fact of negative nature fixed by the researcher.

In some cases, the pedagogical fact revealed by the researcher does not agree with the pedagogical theory: for example, very often following the theory of phased training of students to solve diagnostic problems does not lead the teacher-researcher to the expected result, is recorded as a scientific fact of failure to develop skills required to solve these problems by the students. In this case, the discovered scientific fact, after all of the above-mentioned four "steps", requires the analysis of the specific circumstances of the educational process that led to the failure to develop skills content expected by the teacher, in particular, the analysis of how properly the pedagogical theory focused on the study of its fragment was observed in practice, how reasonably and thoughtfully the resulting technique was applied, how properly the diagnostics of the formation of skills of students expected by the researcher was carried out, etc. If the answer is positive to all these positions, then the question arises about the need to update the theory itself, for example, in the part related to the definition of pedagogical and methodological conditions for achieving the predicted positive valuable result, with the specification of the field of applicability of the theory, clarifying the age format of students for whom the theory is suitable in full format, as well as in any truncated, sometimes with the specification of the necessary starting level of students, and the level of training of teachers for the practical implementation of the developed theory.

Table 1. The results of the expert evaluation of the modified content of the course "History and Philosophy of Science"

Criteria reflecting the assessment by the science consultant of a postgraduate student of the level of his/her general scientific training	The relative number of respondents who meet this criterion (%)	
	before the start of the pilot training	after the end of the pilot training
1. The postgraduate student adequately demonstrated the ability to separate medical events from the medical scientific fact, which helped to formulate the problem and hypothesis of the study.	5.0	28.0
2. The proposed experiential learning program contributed to the proper construction of a postgraduate student research program, the rationale for its various stages, contributing to more clear than it is traditionally manifestation, and obtaining and encoding the result of the study.	10.0	38.0
3. The developed program of experimental training contributed to the competent construction by the applicant for the scientific degree of the experiment procedure, its meaningful implementation and discussion with colleagues in research.	13.0	49.0
4. The experimental course "History and Philosophy of Science" helped to increase the degree of confidence of the postgraduate student in his/her results in the process of research cooperation, in their speech at scientific seminars and conferences.	5.0	53.0

### CONCLUSION

This is the proposed additional content of the training course for postgraduate students of medical and pharmaceutical specialties "History and Philosophy of Science", implementing interdisciplinary connections expressed by the scheme "General scientific methodology → methodology of medicine (pharmacy) → methodology of pedagogy". Its implementation in the educational system of medical graduate school is designed to show students the general methodological framework of their professional research activities and its projection on the field of specific methodology, also directly related to their professional activities. This "bundle" is directly aimed at improving the level of professionalism of persons passing the final stage of higher education.

This conclusion is indirectly confirmed by the method of expert evaluation of the modified content of the course for graduate "History and Philosophy of Science", the results of which are presented in Table 1.

The method of expert examination on the experimental sample, which included 100 scientific supervisors of graduate students of medical and pharmaceutical profile, shows that the direct, rigidly connected with the modified content of the course "History and Philosophy of Science" results (row 1 of Table 1) and the results delayed (rows 2, 3, 4 of Table 1) showed a positive dynamics in favor of the interdisciplinary content developed and justified in the article. In addition, the experiment showed that the proposed enhanced content of intersubject links does not violate the logic of the study of the basic, traditional content of the course "History and Philosophy of Science".

As a relevant segment for further research, the authors also declare the logic in medical and pedagogical knowledge, because, despite the mandatory manifestation of logical forms in the methodology of any branch of knowledge, there is a specific logic in various fields of knowledge. This is quite applicable to pedagogy and medicine today.

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