

**FaR 2021****International Forum “Freedom and responsibility in pivotal times”****DO HUMANITARIANS NEED EXACT SCIENCES? LOOKING  
INTO MODERN RUSSIAN EDUCATIONAL STANDARDS**

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**Abstract**

The article deals with the problems of the formation of mathematical and ICT competencies of humanities students on the basis of FSES3++, in which the principle of free choice of the disciplines and their content by universities is implemented. The authors ask the question: do future teachers need exact sciences for development in their profession, and do the requirements of modern educational standards provide the formation of such competencies? The authors are finding an answer by analyzing modern requirements for the profession, taking into account the total digitalization and the transformation of socio-economic systems and the content of education embedded in modern higher education programs. The article presents data from the modern labor market's study, confirming the increasing demands for such skills as digital literacy, analysis, critical thinking, ability to solve complex problems. Also the authors present the results of a comparative analysis of the list of mathematical and ICT competencies, in particular, in the pedagogical areas of training, included in the educational standards of the two latest generations, and their influence on the content of basic educational programs. Significant contradictions between the trends traced in the content of modern standards concerning the mentioned competencies, and social order for young specialists, formed on the basis of the requirements of employers and life itself, were revealed. The results are especially important on the eve of professional standards' updates, which are to improve the quality of education according to the State Strategic Program for the Development of Education in Russia.

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*Keywords:* Formation of competencies, modern educational standard, soft skills, ICT competencies, pedagogical education, basic educational programs



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## 1. Introduction

In recent years, several generations of educational standards have changed in Russia. More precisely, we are observing not just changes, but their significant transformation, as a result of which universities are given more and more freedom in the formation of the structure and content of their educational programs. Using the terminology of the exact sciences, one can compare the changes that have taken place with the transition to a fundamentally new method of standardization in the higher education system – from imperative to declarative. So, in the classical imperative approach, the description of the system (in this case, the basic educational program (BEP) consists in a strict definition of its structure and content, with an exact indication of the list of disciplines (modules), the sequence in which they should be studied, the content and volume of hours for each discipline, etc. In a declarative or functional approach to describing a system, only basic requirements (rules), restrictions on its implementation are formulated and expected results are determined, while the method of achieving a given result is chosen by the "system" itself – in this case, an educational organization. This approach is used to create complex products – knowledge bases, self-learning intelligent systems. Perhaps the future belongs to this approach, interest in the development of artificial intelligence systems is growing today, but implementation problems still remain unresolved due to the fundamental the complexity of their functioning.

From the analogy in artificial systems, returning to social ones, namely to the modern standard of higher education FSES 3 ++, we can state the functional principle of its implementation. The 3 ++ standard fixes, in the main, the requirements for the results – what competencies should graduates of a particular field of study have. Exactly how these competencies will be mastered, on the basis of which disciplines – this higher educational institution, represented by the head of the BEP, can actually decide on its own. Today, developing basic educational programs in the areas of bachelor's and master's degrees, universities can literally "create" them at their own discretion. This high level of freedom implies and a high level of responsibility. And this responsibility should be manifested both in an accurate understanding of the social demand for the content of professional skills and abilities in the formation of the requirements of standards, and in determining the strategy and tactics for achieving them when creating basic educational programs directly in the field, in universities. Such complex social systems, as well as technical ones, must be implemented as "feedback" systems. It is necessary, especially during the period of development and formation of new educational standards, to monitor, check for the adequacy and correctness of requirements, restrictions, the possibility of achieving a given result on their basis. This study is devoted to the study of this issue for one chosen direction of training bachelors, namely Pedagogical Education. The authors analyze the current trends in the demand for professional and "flexible" skills of teachers and the adequacy of their reflection in the FSES 3 ++ standard in the direction of preparation 44.03.01 (Pedagogical education). In accordance with the authors' specialization, the emphasis was placed on the study of trends in the field of mathematical and ICT competencies. The degree of their relevance in the labor market, inclusion in the basic competencies of the 3 ++ standard is considered. And, finally, the issue of the possibility of mastering these competencies is studied based on the analysis of new educational programs drawn up at Nizhny Novgorod State Linguistic University.

## 2. Problem Statement

The relevance of the work is due to the ongoing significant changes (revision and updating) of the basic educational programs (BEP) of higher education in connection with the entry into force of the next Federal State Educational Standards (FSES 3 ++). How the new requirements of standards are reflected in the curricula of BEP from the point of view of preserving (adding or, conversely, excluding) the disciplines of mathematical and information technology blocks. How much do these changes correspond to the social needs of a modern digital society in the context of the transformation of socio-economic systems taking place today?

## 3. Research Questions

Despite the fact that the problem of improving the quality of education in Russia has long been identified and discussed at the highest level (Concept of development of mathematical..., 2013; On the Federal Target Program..., 2015; State Program of the Russian Federation..., 2017) it is still relevant. Indeed, one of the main tasks of secondary vocational and higher education is the preparation of highly qualified specialists with fundamental theoretical knowledge and a good level of practical skills in the field of their future professional activities. In addition, today special attention is paid to the problem of developing supra-professional qualities (Lizunkov et al., 2021; Rilova, 2019; OECD, 2020a), the so-called soft skills. It is “flexible skills” that allow one to adapt to the rapidly changing conditions of the surrounding world and new requirements of professional activity, to find effective application of the acquired professional skills. According to modern research (Basyuk & Kovaleva, 2019; Burns et al., 2020; Zabelina et al., 2020; Zhukovskaya & Chernenkaya, 2019), the formation of these competencies is based on information and communication literacy. Indeed, modern processes of informatization of society significantly affect the requirements for the training of specialists in any field. The basic supra-professional skills are the ability to work with digital information and the ability to communicate – to build relationships with people, build and argue their point of view, jointly solve professional problems, including remotely, find and implement effective solutions. All this requires from young specialists the ability to think analytically and possession of ICT competencies. What can we say about the fact that those who are directly involved in the process of training future specialists, that is, teachers and educators, should have the appropriate competencies. But do these ideas about “what should be” correspond to “what is”? Are bachelors of pedagogical training areas getting the necessary soft skills today? The main issue that is considered in this article is the question of the correspondence between the need of modern society for mathematical and digital literacy of teachers and the possibility of obtaining relevant competencies in the preparation of bachelors in BEP based on the standards of new generations.

#### **4. Purpose of the Study**

The objectives of this study are:

- analysis and identification of problems in the formation of the required level of mathematical and ICT competencies in the preparation of bachelors in the direction of Pedagogical education based on the new standards of the Federal State Educational Standard 3 ++;
- an assessment of the compliance of the list of competencies laid down in these standards with trends in the changing demand for the skills of modern teachers, which clearly emerged against the background of the 2020 crisis and strengthened in the subsequent period.

#### **5. Research Methods**

Fundamental to the research being conducted are the method of theoretical analysis, as well as the descriptive method, including the techniques of observation, interpretation, comparison and generalization.

#### **6. Findings**

The study consisted in the analysis of the BEP NGLU them Dobrolyubov in the direction of training 44.03.01 Pedagogical education, for the correspondence of the possibilities of mastering mathematical and ICT competencies ("what is") with the demands of the modern labor market ("what should be"). That is, what kind of over-professional skills a modern teacher must have for the successful implementation of his activities. Determining "what should be" we will rely on the results of sociological research in recent years. First of all, according to the data of domestic and foreign studies, the crisis of 2020 reinforced the pre-pandemic trends in the demand for information technology skills and updated the demand for shared digital competencies (WEF, 2020). According to analysts of such services as Rabota.ru and SberIndex, the main requirements of employers in 2021–2022 will be computer literacy and understanding of the basic principles of cybersecurity (Maltseva & Rozenfeld, 2020). Indeed, the global digitalization of all socio-economic processes that we are witnessing today demanded a fundamentally different attitude to digital literacy. It has become an absolute must for everyone, and sometimes a condition for keeping a job (OECD, 2020b). So, since the spring of 2020, during the period of a total and almost instantaneous transition to distance learning, many teachers and educators could not cope with their professional duties precisely because of the low level of digital literacy. So, we can state that it is digital skills in the 21st century are considered as the most important components of general competence. The discussion and search for effective methods and means of developing these skills among students today is of considerable interest in the professional pedagogical environment. The works of many authors are devoted to this issue (Sryamkina et al., 2016).

The second obvious trend, which not only has not weakened, but, on the contrary, has strengthened in recent years in our turbulent world, is the demand for critical thinking and the ability to analyze information for decision-making. In fact, the relevance of these skills in the modern world can be considered in conjunction with total digitalization and huge flows of information in which you need to navigate, be able to quickly analyze, highlight the main thing, verify, make informed inputs, and, ultimately, synthesize

optimal solutions. These are the skills we are talking about. According to the World Economic Forum [WEF] (2020), the first two points in 2019 and 2020 in the Top 10 Soft-Skills were the ability to solve complex problems and critical thinking (Maltseva & Rozenfeld, 2020). According to a survey of the company, the executives conducted on foreign integrator platforms in 2020 (Deloitte, 2020), critical thinking, analysis, and the ability to solve complex problems were also among the most significant skills. A high demand for these skills is also noted by Russian aggregators of additional education (Korshunov & Shirokova, 2020). The results of surveys of employers conducted on the aggregator hh.ru show (Rilova, 2019) that the ability to analyze and critical thinking today are the key criteria according to which the leaders of prestigious firms select employees. The formation of these skills directly depends on the ability to think analytically and logically, that is, on the development of mathematical thinking, which is the main task of mathematical disciplines. Let us now turn to the analysis of "what is", that is, what content of education is required from the BEP by the current standards of the Federal State Educational Standard of Higher Education 3+ and 3 ++ majoring in 44.03.01 Pedagogical education (FSES HE, 2015). From the unified list of basic compulsory disciplines (modules) in the new standards, only physical culture, life safety and several disciplines, depending on the direction of training, for example, for pedagogical education – history, philosophy, a foreign language, remained. Moreover, in the requirements for the structure of the bachelor's program, even the detailing of the main educational Block1 (Disciplines (modules)) is not carried out. At the same time, the emphasis is on the requirements for the results of mastering the program, presented in the form of a list of universal, general and professional competencies. What competencies in the mathematical and ICT areas of interest to us are “laid down” in these standards?

In FSES HE 3+ (FSES HE Chapter 5. Requirements for the results of mastering a bachelor's program, 2015) of the entire list of competencies, only one is related to mathematical, while being in the category of general cultural: general cultural competence (GCC-3) – the ability to use natural science and mathematical knowledge to navigate in the modern information space. As for the competencies in the field of information technology, they are not represented at all, except for professional competence PC-2 (the ability to use modern methods and technologies of teaching and diagnostics), which, due to the "vague" formulation, belongs to the BEP (as practice shows) to the humanitarian disciplines.

In the list of requirements for the results of mastering the undergraduate program of the Federal State Educational Standard of Higher Education 3 ++ (FSES HE Chapter 3, 2018), the competencies of interest to us include the following. Universal competencies UK-1 are capable for search, critical analysis and synthesis of information, applying a systematic approach to solving set tasks (in the System and Critical Thinking category). General professional competence GPC-2 is able to participate in the development of basic and additional educational programs, to develop their individual components (including using information and communication technologies). Thus, we see all the same problems as in the previous standard: there are only two competencies, the wording of which is rather vague. As a comparison, in the Federal standard of HE of the third generation (050100 "Pedagogical education" dated May 31, 2011) there were 9 competencies related to the formation of mathematical and information technology skills: 5 general cultural (GCC-4, 8, 9, 12, 13) and 4 professional (GPC-6, PC-2, 4, 8) competencies. This "impoverishment" of the requirements of the standards for the training of specialists is immediately reflected in the general educational programs and curricula. Mathematical and information technology disciplines become

unnecessary for the implementation of BOP and automatically move into the category of "superfluous" disciplines, for the study of which fewer credits are allocated or are completely excluded from the curriculum. So, for example, in the curriculum of NGLU named after Dobrolyubov implemented in 2016-2020 for the preparation of bachelors in the direction of Pedagogical Education, there are no mathematical disciplines, and the ICT block is represented by one compulsory discipline "Modern Information Technologies" (MIT) in the amount of 2 credit units. And this is for all 4 years of training for future teachers! At the same time, one has to take into account the heterogeneous and, on average, rather low basic level of training of students in the humanities in mathematical and information technology disciplines (Nikolskaya & Rodkina, 2018). Many at the stage of entering the university from the entire Computer Science and ICT course know only the basics of working in a text editor. As a result, the work program of the MIT discipline is aimed at developing basic skills in working with office applications. Specialized packages of applied programs for linguistic research, the practice of working in a distance-learning environment and the creation of online courses, for example, necessary in future teaching activities, cannot be included in this discipline.

Today, with the introduction of amendments to new educational standards and the development of new model basic educational programs, the situation can be changed if we take into account the existing negative experience. So, in clause 1.4 of the general provisions, the FSES HE 3 ++ standard (FSES HE, 2018) obliges universities to be guided by the "corresponding model basic educational program (MBEP) included in the VET register" in the preparation of the BEP. At the same time, the BEP project in the direction of 44.03.01, officially presented on the portal of the Federal State Educational Standards, supplements the competencies with recommended indicators of their achievement, in which the requirements of ICT skills are clearly traced. For example, GPC-2 (Able to participate in the development of basic and additional educational programs, develop their individual components) is equipped with an indicator of achievement GPC-2.3 (it selects pedagogical and other technologies, including information and communication technologies, used in the development of basic and additional educational programs and their elements). GPC-5 is able to monitor and assess the formation of the results of education of students). Indicator GPC-5.1 carries out the choice of content, methods, techniques for organizing control and assessment, including ICT. RPC-3 is able to implement educational programs of various levels in accordance with modern methods and technologies, including information. Indicator RPC -3.2 carries out the selection of subject content, methods, techniques and technologies, including information. The above requirements for learning outcomes are quite numerous and should be reflected in the recommended compulsory disciplines, the teaching of which should be carried out systematically at each course of study. The inclusion of a compulsory block of mathematical and ICT disciplines in VET will be a guide to action for all universities and will serve as the basis for including the relevant disciplines in the curricula.

## **7. Conclusion**

In the context of general instability and the forced digitalization of socio-economic processes that are features of our time, information literacy and analytical thinking have acquired the importance of the most important soft skills today. These skills are not formed spontaneously, as a result of socialization and the accumulation of experience, they must be developed at all stages of training, including in the process

of training at a university. At the same time, in the successive standards of the Federal State Educational Standard of Higher Education, there is a serious degradation of the requirements for information, technical and mathematical competencies. At the same time, the absence of the requirements for the mandatory inclusion of relevant disciplines (modules) in the educational program and the provision of universities with the opportunity to independently determine the content of the educational program, lead in practice to an ever-increasing reduction or even exclusion of mathematical and ICT disciplines from the curricula of humanitarian areas. As a result, instead of the required trend towards an increase in the level of information, technical and mathematical literacy of teachers, we can get directly the opposite result, which clearly runs counter to the strategic national plans for the development of education and the economy as a whole. A way out of this situation can be a clearer description of the content of competency requirements in the model educational programs recommended by the Ministry of Education of the Russian Federation and the inclusion of mathematical and information technology blocks in the list of compulsory disciplines.

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