



TEACHING ACTIVITY IN THE DIGITAL ENVIRONMENT OF THE UNIVERSITY

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Abstract. The rapid spread of information technologies that radically influence our life and educational space, the change in the structure of needs and activities as a psychological consequence of the development of information technologies for a person — all these factors entail changes in the roles and functions of the teacher in the new digital environment of the university, sharpen questions about their competence, competitiveness, and improving the quality of education in Russian university. The purpose of this research is to identify empirically the professional and psychological difficulties and problems in the teaching activity of military university staff ($n = 100$) related to their readiness to transform according to a new standard focused on e-learning. The methodological basis of the study was the theoretical model of the unified information environment of the university (N.V. Tikhomirova). The author's questionnaire of the teacher was used as the research method. During the study, data were obtained on three groups of teachers who differ in their willingness to carry out pedagogical activities in conditions of uncertainty associated with the nature and tasks in the digital environment of the university. Statistical processing of the obtained results using the method of discriminant analysis showed that these groups statistically significantly differ in their potential capabilities, willingness to be subjects of the information educational environment, results and achievements in e-learning. The main internal obstacle/difficulty is the unwillingness to take a position within the information educational environment, lack of understanding of their new role in it, that is, certain problems in professional self-awareness. It was found that the position of the teacher (active, passive or external) is neither related to the teaching experience at university, and to their age, nor to their scientific status and position. The predictor of the effectiveness of the teacher's educational activity in the digital environment is military-technical education. The applied aspect of this work is that it makes a certain contribution to the understanding of the difficulties and problems of the university teacher in the conditions of digitalization of education.

Keywords: teaching activity; information educational environment; electronic content; e-learning; information and communication technologies (ICT); discriminant analysis.

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ПЕДАГОГИЧЕСКАЯ ДЕЯТЕЛЬНОСТЬ В ЦИФРОВОЙ СРЕДЕ ВУЗА

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Аннотация. Стремительное распространение информационных технологий, радикально меняющих жизненное и образовательное пространство, изменение структуры потребностей и деятельностей как психологическое последствие развития информационных технологий для человека — все эти факторы влекут за собой изменения ролей и функций преподавателя в новой цифровой среде вуза, заостряют вопросы о его компетентности, конкурентоспособности, о повышении качества образования в российском вузе. Цель данной работы — выявить эмпирическим путем профессионально-психологические трудности и проблемы в педагогической деятельности преподавателей военного вуза ($n = 100$), связанные с их готовностью к переходу на новый стандарт, ориентированный на электронное обучение. Методологической основой исследования послужила теоретическая модель единой информационной среды вуза (Н.В. Тихомирова). В качестве методики исследования использовался авторский опросник преподавателя. В ходе исследования получены данные о трех группах преподавателей, отличающихся своей готовностью осуществлять педагогическую деятельность в условиях неопределенности, связанной с характером и задачами в цифровой среде вуза. Статистическая обработка полученных результатов с помощью метода дискриминантного анализа показала, что данные группы статистически достоверно отличаются своими потенциальными возможностями, готовностью быть субъектами информационной образовательной среды, результатами и достижениями в электронном обучении. Главное внутреннее препятствие/трудность — это нежелание, неготовность занять позицию внутри информационной образовательной среды, непонимание своей новой роли в ней, то есть определенные проблемы в профессиональном самосознании. Было установлено, что позиция преподавателя (активная, пассивная или внесредовая) не связана ни с педагогическим стажем в вузе, а значит и с возрастом, ни с его научным статусом и должностью. Предиктором эффективности образовательной деятельности преподавателя в цифровой среде выступает военно-техническое образование. Прикладной аспект данной работы заключается в том, что она вносит определенный вклад в понимание трудностей и проблем преподавателя вуза в условиях цифровизации образования.

Ключевые слова: педагогическая деятельность; информационная образовательная среда; электронный контент; электронное обучение; информационно-коммуникационные технологии (ИКТ); дискриминантный анализ.

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Introduction

Modern higher education should fully meet the challenges of the era — the age of information technology. The new essence of the educational process can no longer be satisfied with the traditional means of teaching, the basis of which is a textbook, a workbook on the subject. There is a need to create a new category of learning objects, which, as carriers and integrators of information, should become organizers of cognitive activity of students, aimed at joint learning, should provide the opportunity for practical development of the acquired knowledge and their control. The tool that meets such complex and diverse requirements is the electronic content used in e-learning [1].

E-learning conceptually changes the model of educational activity, methods of scientific research, provides tools for continuous learning and thereby improving competitiveness, that is, in the interpretation of L.M. Mitina [2], the ability to update and use all opportunities for development.

In a theoretical study of the psychological consequences of the development of information technologies, V.A. Emelin, E.I. Rasskazova, and A.Sh. Tostov [3] named changes in the structure of needs and activities among four factors. The rapid development of technical means changes the requirements for a person, affecting the development of various skills and abilities. The changed structure of activities requires the development of other skills — these are the consequences of the technical process. In the information society, the measure of a person's familiarity with technology and information technologies becomes a value.

The rapid spread of information technologies radically changing the life and educational space increases the scale and depth of uncertainty of the present and future [4, p. 23]. In the conditions of digitalization of education, the university teacher has new roles and functions: not only the quality of conducting training sessions, creating a developing educational environment, but also the need to become a full-fledged subject of the information educational environment. That is, to develop electronic content in the form of electronic manuals and electronic textbooks, control and training computer programs, remote interactive courses, to use them actively in educational activities, to participate in on-line conferences, webinars, to use the resources of the electronic library of the university and to involve cadets in this process.

The situation of uncertainty and inconsistency is further aggravated for the teacher due to the fact that the didactic foundations of the online lesson are different from the traditional one, and they have not yet been developed. The lack of methodological and psychodidactic foundations of digital education was pointed out in July 2021 in their reports at the International Scientific and Practical Conference led by L.M. Mitina «New psychology of professional work of a teacher: from unstable reality to sustainable development», corresponding member of the RAO Professor V.I. Panov, professor from Bulgaria S.G. Chavdarova-Kostova. This problem also exists in foreign science [5].

The wide spread of information technologies (IT) has led to the need for the formation of a new professionally significant competence — information and communication, which allows using IT to optimize professional activities, effectively work with information and interact [6, p. 23]. The development of professionally

significant qualities of a teacher in the new conditions is associated with the formation of skills to technologize the activities (mastering the means of information and communication technologies (ICT) and embedding them in the educational process) and to optimize time costs in order to free up time for creative work, which contributes to the formation of the ability to identify and control information processes in their professional activities [7].

The implementation of the new federal state educational standards dictates the need to switch to domestic software. In this regard, the question arises: if the teaching staff of the university is ready to move to new standards in terms of the development and use of domestic software, and what professional and psychological difficulties the teaching staff will have in this case.

To answer these questions, we conducted an empirical study on the study of the information educational environment of the university in 2019, on the basis of the Ryazan Guards Higher Airborne Command School [8].

The purpose of the study is to empirically determine the readiness of the university's teaching staff to the new conditions of pedagogical activity in the unified information educational environment and to identify pedagogical predictors of the effectiveness of educational activities in the information environment of the school.

Literature review

In search of a methodological basis for our study, we selected and studied domestic and foreign literary sources devoted to the issues of the information educational environment and e-learning.

In the works of N.A. Kibishvili [9], M.V. Kirgintsev [10], Yu.I. Lobanov, V.V. Annenkov and O.A. Ilchenko [11], the educational space of the university is considered as an information environment and an integral factor of professional and personal formation and development of students, as a condition for their successful training and self-education. A.O. Kuratov [12] and O.A. Lukashevich [13] in their research mark the orientation of the information educational environment of the university on the development of the creative personality of the future specialist, his personality, as well as the formation of a firm civic position among cadets.

The works of M.G. Evdokimova [14], L.B. Ivanova [15], S.V. Zenkina [16], K.A. Klimov [17], S.L. Myakishev [18] are devoted to the issues of teaching activity in the modern educational environment, the problems of methods of organizing the information educational space as a factor of improving the quality of education, as well as the development of teacher skills for the implementation of «information activities».

In foreign pedagogy and psychology, the authors' attention in 2000–2010 to blended learning, combining face-to-face and online interaction, gradually shifted in 2011–2021 towards virtual learning and distance learning.

And the COVID-19 pandemic has significantly accelerated this process. Studies of Shazia Mumtaz reveal a number of factors which influence teachers' decisions to use ICT in the classroom: access to resources, quality of software and hardware, ease of use, incentives to change, support and collegiality in their school, school and national policy, commitment to professional learning and background in formal computer training. At the same time, the author emphasizes the role of pedagogy and suggests that teachers' beliefs about teaching and learning with ICT are central to integration [19, p. 319].

The idea to go beyond the instrumental approach to online learning sounds both in domestic [20] and foreign science [5]. For example, C. Carrillo and M.A. Flores [ibid] suggest switching from an instrumental approach in online learning to a psychodidactic one. After analyzing the topics of 134 empirical studies on online learning and teacher training over the past 20 years, they received the following data. The majority of publications are devoted to the interaction of subjects of the information educational environment (20.1%) and online learning communities (15.7%). These topics are discussed, for example, in scientific articles by Sh. Erikson, Ch. Neilson, R. O'Halloran, Ch. Bruce, E. McLaughlin [21] and Z. Abidin, A. Mathrani, R. Hunter [22], respectively. Scientific publications on the role of the teacher and his involvement in online learning [23, 24], on the knowledge and digital competencies necessary for this [25] take the third and fourth places in the relevant topics, respectively, 11.2% and 8.2%. A certain share of publications is devoted to the use of video in e-learning (6.7%). The problems of feedback and evaluation are raised in 6% of publications, for example, the work of I. Huet and D. Casanova should be mentioned here [26]. The remaining topics account for the remaining 32.1%.

The concept of a unified information environment developed by N.V. Tikhomirova [1] served as a theoretical basis for the study. The model of the unified information environment of the university contains the architecture of an electronic communication-integrated management system and interaction of teaching staff, employees and students. In this model, we are primarily interested in the tasks of teaching staff in the process of e-learning: preparation of the educational process, development of electronic content, implementation of training activities, monitoring, final control, electronic document management.

Materials and methods

In the analyzed Russian and foreign literature sources on the digital environment, we have not found any experimental methods that are isomorphic to the theoretical basis of the study — the model of the unified information environment of the university (N.V. Tikhomirova). In this regard, the author's method was developed and used in the experiment: the teacher's questionnaire. The methodology contains 16 questions and consists of three blocks:

- 1) potential opportunities (teaching experience at the university, scientific status, education, advanced training courses in e-learning programs);
- 2) readiness (already existing experience in creating electronic content; planning to do this the next year; reasons for the lack of development);
- 3) current results and achievements of the teacher in the information environment for the last three years.

The second block of the methodology covers questions about the teacher's future opportunities. It includes the existing experience of creating electronic content, but from a different position — from the position of increasing demand. «With increasing opportunities, needs grow» [3, p. 85]. An open question in this block about the reasons for the lack of electronic content development in the teaching staff is of great importance for understanding the problems and difficulties of the teacher in the information educational environment. Here, in addition to the proposed answer options, the participant of the experiment is asked to formulate the reason himself. Extreme workload with other types of teaching activities, adherence to traditional

teaching methods, and the opinion that electronic content should be developed by someone else, but not by the teacher — these responses indicate a low degree of readiness of the teacher to take an active position in the information educational environment of the university. The teacher's awareness of the lack of knowledge in the field of information and communication technologies (ICT) can be regarded as a positive reflexive position in relation to his readiness to develop electronic content.

The third set of questions in the methodology affects the teacher's existing reserve for creating pedagogical scenarios of control and training computer programs, electronic manuals/textbooks. It includes the frequency of using ICT tools in the implementation of various types of knowledge control among cadets and in educational activities in general, the authorship of educational publications placed in the electronic library of the university, the regularity of using the resources of the electronic library of the school and involving cadets in this, as well as participation in webinars and video conferences.

Individual questions of the methodology assume answers in the form of a dyad — yes/no, and these answers are evaluated accordingly by 1/0 points. For the other questions the role of participation (degree of activity) of the teacher in the information educational environment is important: high degree (regular use, participation, development, authorship), low (used periodically, from time to time) and external position (did not use, did not participate, did not develop).

Research results

The study involved 100 teachers from four departments of the Ryazan Guards Higher Airborne Command School: military personnel and civilian personnel with teaching experience in a military university from 6 months to 50 years. The majority of the participants in the experiment have a pedagogical education — 43%, in second place — 38% of teachers with a military education. The remaining 19% of the teaching staff have a linguistic, technical and humanitarian education.

15 % of teachers were trained in e-learning programs as part of advanced training.

63 % of the respondents expressed their readiness to develop an electronic textbook on the disciplines of the department the next calendar year. Moreover, 34 % of teachers have already had some scientific background, experience in developing electronic content in the form of electronic textbooks, pedagogical scenarios for control and training computer programs, and 29 % of teachers plan to do this for the first time.

The reflexive position on the reasons that can be an obstacle to e-learning is presented in the analysis of the professional and psychological difficulties of university teaching staff in the development of electronic content. About half of the responses indicate negative motivation of teachers and their low readiness to develop electronic content. The respondents who do not have in their arsenal of author's electronic textbooks/electronic manuals and pedagogical scenarios of control and training computer programs show that the reason for it is the extreme workload of other types of teaching activities — 34.2%. 28.8% of teachers believe that specially trained professionals should be engaged in the development of electronic content. 23.6% of teachers point to the lack of knowledge in the field of ICT.

The substantial hypothesis of the study was that teachers in the information educational environment of the school adhere to any one of three positions: active, passive, or external.

The first group of teachers with an active position (52%), figuratively speaking, in an environment like a pickle, creates an electronic product and regularly uses it in educational, methodological and scientific activities. They have a cognitive need for this (and a willingness to develop electronic content) and meet the cognitive needs of cadets.

The second group of teachers is users (34%). They have not created electronic content yet, but they use the experience of others from time to time and feel the opportunity/willingness to start this type of activity.

And finally, the third group of teachers is teachers with an external position (14%). They do not create or use or seldom use modern ICTs due to internal reasons and external circumstances. The main internal obstacle/difficulty is the unwillingness, unwillingness to take a position within the information educational environment, lack of understanding of their new role in it and certain problems in professional self-awareness.

Statistical analysis of the data was carried out using the IBM SPSS Statistics 24 package. To test the content hypothesis, we used a statistical method — discriminant analysis. Discriminant variables can be considered as a multidimensional dependent variable, and the classifying variable can be considered as a factor. This method is used to determine the reliability of distinguishing classes by the totality of all variables (by λ -Wilks) and by each of the discriminant variables separately (by the F-Fisher criterion). Discriminant analysis allows us to conduct a detailed study of the differences between the gradations of the dependent variable, that is, in our case, between groups of teachers. The variables from the three blocks of the questionnaire, measured in points, i.e. on a quantitative scale, were used as independent variables. There are 11 independent variables and one grouping variable ranging from one to three. We will call three groups of teachers conditionally: 1) active group; 2) users, and 3) passive group.

In the course of the discriminant analysis, the statistical hypothesis H_1 was tested: whether the groups of teachers, conditionally identified by us depending on their position in the information educational environment of the university, differ in this set of discriminant variables (their capabilities, willingness to be a subject of the information educational environment, results and achievements). Or the selected groups of teachers do not differ statistically significantly according to these criteria — H_0 .

A comparison of the equality of group averages using λ -Wilks and F-Fischer showed that statistically significant groups of teachers differ in all discriminant variables: with degrees of freedom of 97, $p = 0.001$ for nine variables; for the variable «courses in e-learning programs» $p = 0.046$, for the variable «pedagogical scenarios for control and training computer programs» $p = 0.004$. Thus, the hypothesis H_1 was confirmed: groups of teachers, depending on their position in the information educational environment of the university, statistically significantly differ in their capabilities, willingness to be a subject of the information educational environment, results and achievements in e-learning.

The analysis used six discriminant variables and two canonical discriminant functions. The six discriminant variables are planning the development of electronic content in the coming year, regular use of computer tests to control the knowledge of cadets, reflection on difficulties/problems in e-learning (the Cause variable), active participation in webinars/video conferences, involvement of cadets to work in the

electronic library of the university, authorship of the educational papers published in the electronic library. The results of the step-by-step analysis indicate how, at each step, as the number of variables increases, the distinguishing ability of the set of discriminant variables increases uniformly (λ decreases): λ decreases from 0.661 at the first step to 0.236 at the sixth step ($p = 0.001$), the number of degrees of freedom is 97. That is, the groups of teachers are most different at step 6, when six variables are included in the analysis, which means that the specified set of variables has the highest distinguishing ability.

An indicator of the quality of the discriminant analysis performed is the percentage of matches of the a priori distribution of objects in groups with a probabilistic distribution. In our case, it was 89.0%, a very high result according to A. Byuyul and P. Zefel [27].

Using standardized canonical discriminant function coefficients, we determine the ratio of the contributions of variables to each of the canonical functions. The main contribution to each of the two functions is made by the variable «difficulties and problems of the university's teaching staff in the information environment». In statistical analysis, for brevity, it is indicated by the name of the question in the experimental method.

The structural coefficients of canonical functions, like factor loads, are the correlation coefficients of variables with a function and allow us to interpret functions: the greater the values of these variables, the greater the value of the function. Thus, the first function is associated with a positive (positive coefficient value) assessment of difficulties and problems in e-learning (coefficient 0.614), plans for the development of electronic content in the future (0.547), involvement of cadets in the work in the electronic library of the school (0.559), participation in webinars (0.540), regular computer testing during all types of control of cadets' knowledge (0.452), authorship of educational publications placed in the electronic library of the university (0.403). The second function is associated with a negative (negative value of the coefficient) assessment of difficulties and problems in e-learning (coefficient -0.612), the lack of plans for the development of electronic content in the future (-0.255), non-involvement of cadets in the work in the electronic library of the university (-0.110), active participation in webinars (0.528), periodic computer testing to control the knowledge of cadets (0.380), authorship of educational publications placed in the electronic library of the university (0.203).

Thus, we can conditionally designate function 2 as problems and difficulties experienced by teachers in e-learning, and function 1 as the teacher's willingness to overcome them and be an active subject of the information educational environment of the university.

The coordinates of the centroids for all three groups allow us to interpret the canonical functions with respect to their role in distinguishing classes. For function 1, the centroid for group 1 is located at the positive pole, and the centroids of the other two groups are located at the negative pole, and the centroid of the third external group is slightly further from the center. The greater the value of this function, the greater the willingness of the teacher to be a full-fledged subject of the information educational environment of the university. For function 2, the teachers of the passive group have the highest indicators, in group 1, the indicators are close to zero. The intermediate position between them is occupied by the group of teachers-users.

Using the statistical criterion φ^* of the Fisher angular transformation, it was established that the position of a teacher in the information educational environment of a school (active, users or passive) is not statistically significantly related to either the teaching experience at the university (and therefore to age), or to his scientific status (and therefore to the position). The statement that the main developers and consumers of an electronic product in the world are young people aged 23–39 years, in the conditions of the information educational environment of the university does not work.

At the same time, teachers who have received a military or technical education are statistically significantly more likely to take an active position in the information educational environment of the school and are more effective in e-learning than their colleagues with a pedagogical or humanitarian education: $\varphi^*=2.473$ at $p = 0.005$.

Discussion and conclusion

Based on the results obtained during the study, the main problems experienced by the university's teaching staff in the implementation of new standards related to the transformation to domestic software were discussed. The main psychological problem is a certain bias in professional self-awareness: lack of understanding of a new role and functions of the teacher in the new conditions, in the information educational environment; unwillingness, unwillingness to take a position within the environment; ignorance or misunderstanding of the psychological consequences of the development of information technologies for the individual, manifested in a change in the structure of activities, the structure of needs. Other difficulties are related to the insufficiently effective allocation of work time; lack of knowledge in the field of ICT.

It was statistically established that the predictor of the effectiveness of educational activities is the teacher's education (military — technical). Neither the teaching experience at the university and, accordingly, the age, nor the scientific status and, accordingly, the position, are the predictors of the effectiveness of educational activities in the information environment of the school.

This conclusion underlines the necessity to create a large division of specialists in the school and attract significant resources. The functionality of this division should be the production of electronic courses, scanning of full-text educational materials, and searching the Internet for free educational resources [1].

It is recommended to create groups of teachers in the pedagogical environment with different positions (active, passive, external) to involve them in joint projects for the development of electronic content. At the same time, teachers with an active position would share their experience in digital education with the rest of the group members, help them overcome psychological, didactic and technical difficulties, and teachers with a passive position, enriching themselves with new knowledge and experience, would gradually change their beliefs about the use/non-use of ICT in the educational process. Having discovered the possibilities of digital education, they start to experience new needs in the use of ICT.

The involvement of teachers with an active position from innovators in research work on the development of didactic foundations of digital education will expand the horizon of their professional activity; will contribute to their personal and professional development.

Of course, it is necessary to informally organize the university and non-university system of advanced training of teaching staff on the course «Electronic educational environment: information technologies in the educational process», modernization of the educational and material base by means of information support.

In conclusion, we asked about the possibility of extrapolating the conclusions made during the study to the digital environment in the higher education system as a whole. One of the main psychological characteristics of the subject is the age. The average age of university teachers in the country according to data for 2014 is 48.9 years [28]. The average age of the participants in the experiment was 48 years. We compared the empirical distribution of teachers in six age groups with the theoretical one using the statistical criterion of agreement χ^2 and obtained confirmation of statistically significant differences between these two distributions: $\chi^2 = 28,533$ at $p = 0.001$. Thus, the information educational environment of a military university has some specifics, and the conclusions obtained cannot be unambiguously extended to other universities. In any case, the study of the information educational environment of the university requires further research in this direction.

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