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The methodological foundations of teacher preparation for designing inclusive informational and educational environment

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Abstract — **Inclusive education is a promising form for persons with special needs. It is important to update the capacity of information technologies, including remote-sensing ones, and digital educational resources. Modern teachers are not ready to provide effective training for persons with disabilities because they do not have special knowledge about the psychological characteristics, information and communication competence for effective teaching organization. The set of comparative, cluster and participatory approaches can become a methodological regulatory when examining the process of teacher preparation for designing inclusive informational and educational environment.**

Keywords — inclusive informational and educational environment, teacher education, person with special needs, inclusive competence.

I. INTRODUCTION

The development of the national education system becomes a key element of global competition and one of the most important values of life. A new orientation of the education system is manifested in different directions of its development: establishing the system of continuous education, emergence of alternative forms of learning and new approaches to formation of the education content, creating the learning environment available to students of all categories, including persons with disabilities.

The improvement issue of the content of theoretical and methodological, methodical and practical teacher preparation for designing inclusive informational and educational environment based on evidence-based points of development and implementation of multimedia technologies and which is an extensive system that takes into account different components of teacher preparation, has been becoming more relevant in such circumstances [1]. The urgency of the problem has been confirmed by data of the 2011-2018 pilot study. The questionnaire of teaching staff allowed to establish that the majority of the respondents recognized the implementation of inclusive informational and educational environment (74%). In this, 95% of them considered special preparation for designing of inclusive environment objects to be imperative, 89% of these respondents pointed to the lack of methodical, technological, theoretical knowledge for creating a qualitative educational product for students with special needs. 278 students-respondents, among them 24 students with disabilities, were questioned about the essence and opportunities of informational and educational environment. There were not respondents who never used a personal computer and the Internet resources in training. Most students (94%) had an opportunity to use the Internet for educational purposes, 64% of respondents were constant users of that network, and not more than 27% turned to a sector of informational and educational environment of the University almost every day. 74% of respondents decided that these education opportunities provided by that resource were useful and accessible. 85% of respondents said that there was the lack of the necessary skills, enabling to design informational and educational resources in their own, the vast majority (100%) had no idea about the theoretical and methodical basis of designing inclusive informational and educational environment. A separate cluster was addressed to students with special needs to identify difficulties and barriers in education and features of social relationships at the University, and awareness of the personal problems and character of expected help from teachers, students, authorities, and other structures of the higher education organization. The interpretation and synthesis of the obtained data allows to identify the lack of functional, technologically feasible, motivational inclusive informational and educational environment [1]. 42% of respondents do not know about the organization of training; not more than 30% of students demonstrate the interest in a future profession, accompanied by a better understanding of an occupation object and content; almost half of respondents decide that learning process at the University is disconnected from reality and not oriented to maximum preparation for work; 60% of them indicate the lack of necessary monitoring tools of learning; 25% are not satisfied with preparedness of independent training activities.

II. METHODOLOGY

The complexity and multilevel of teacher preparation for designing inclusive informational and educational environment

requires the theoretical and methodological toolkit to research this issue. The synthesis of comparative (general scientific basis), cluster (certain scientific level) and participatory (methodical and technological level) approaches can become this tool. The founders of comparative basis research are Aristotle, T. Benfey, F. Bacon, M. Weber, E. Husserl, I. Kant, N. Kuzansky, J. Locke, S. Montesquieu, K.M. Nikonov, Plato and others. Comparative approach is considered in studies as a methodological benchmark to examine public and institutional processes in order to compare theoretical teachers and educationalists attitudes, different education models and models of the educational policy, to harmonize terminology and definitions of pedagogy, predict ways of the inclusive higher education development. The prominent positions of cluster approach are formulated by A.V. Baygildeev, L.B. Vorontsova, D.Y. Lapygin, A.V. Timiryasova, G.R. Hamidullina, R.I. Khikmatov, T.I. Shamova, O.E. Yavorsky and others. Cluster approach is identified as a strategy of scientific creation of the useful and cost-effective cluster structure of University student preparation for designing inclusive informational and educational environment. Participatory approach (O.J. Afanaseva, E.J. Nikitina and others) chosen as a methodical and technological strategy identifies the tactic of inclusive educational process organization, providing the active participation of subjects, including persons with disabilities, in organization and management of educational and professional activities based on mainstreaming of an interactive capacity, mutual scrutiny and co-responsibility. The synthesis of approaches which make up methodological regulatory of the pedagogical concept of teacher preparation for designing inclusive informational and educational environment allows to form the standard of a person due to integration of the Russian education to the European and world community, development of inclusive higher education; to ensure active person involving in the inclusive society; to construct networking of teacher preparation for designing inclusive informational and educational environment subjects; to improve education motivation of students with special needs at University; to provide satisfaction of educational and professional activities, realization of special educational needs; to implement an inclusive competence with the use of participatory education character, reconciliation of theory teaching and project activities [2].

The set of pattern, principles and functions of teacher preparation for designing inclusive informational and educational environment as the important elements of this concept have been developed on the basis of the synthesis of comparative, cluster and participatory approaches.

The determinant pattern fixes the causal links of the process with factors which have a direct impact and are objective, and necessary: 1) an impact of the principles of State policy and dynamics of social relations change on development of the value system of educational inclusion; 2) an impact of the economic opportunities, pace of development of science and technology, institutional and network interaction on content and technologies of inclusive higher education. The attributive pattern reveals the inner features and property of this process: 1) an including of a person in inclusive educational process identifies a willingness to create inclusive informational and educational environment and ensures special conditions which compensate the limitation of persons with special needs life; 2) a character of interaction of students with different educational needs, including students with disabilities, and existence of general values identifies the unity of the social development and a professional education person who is capable of highly-skilled activities and tolerant communication under the inclusive society [3]. The productive pattern determines the productive change circumstances and is connected with the improvement of teacher preparation for designing inclusive informational and educational environment. That is, getting of the greatest possible results while minimizing the cost does not requires additional resources, the required result has been achieved, and there is a reserve capacity for the further development. 1) the effectiveness of preparation for designing inclusive informational and educational environment depends on University student's inclusion in productive meeting the pedagogical and project challenges of inclusion direction [4]; 2) the success of development of an inclusive competence which connects the pedagogical, information, communication competences depends on independent realization of full circle of constructive work on designing inclusive informational and educational environment.

The principle system genetically links with the identification of meaningful patterns and includes inclusive education (personal educational and professional trajectory, facilitation); higher school pedagogy (continuity; vitagennic student experience); pedagogical design (mainstreaming of the information technology capacity; balance and dynamism). The principle of personal educational and professional trajectory (S.N. Vinogradsky, A.G. Gogoberidze, M.S. Knowles and others) is to ensure a possibility of choice the individual trajectory of professional development, permitting freedom of target selection, content, forms, methods, sources, funds, time frames, time, place of education, assessment of the educational achievements, the greatest possible maintaining of individual education. The facilitation principle (E.N. Gusinsky, E.F. Zeer, K.Rogers, V.A. Slastenin, and etc.) is a pedagogical category representing the regulation for creating conditions of student awareness of individual essence, independence, for establishment of life circumstances. This principle is a benchmark for creating strategy and tactic of designing inclusive informational and educational environment, diagnosis of educational and professional activities subjects' needs, ways of motivation and other problems overcoming, system identification of means which ensure the solution of life and professional self-determination challenges. The continuity principle (S.G. Vershlovsky, A.P. Vladislavlev, B.G. Gershunsky, N.K. Sergeev, N.K. Onushkin and others) gives the opportunity to connect, integrate all the discontinuous elements of the inclusive educational system which allows educational and professional activities subject to successfully adapt to any part of the education subsystem during his or her life. The vitagennic student experience principle (A. S. Agafonova, V. Bogina, Y. N. Kulyutkin, I. S. Marienko, K. N. Stolypin, M. N. Terekhin and others) implies address to knowledge, senses, activities which determine person attitude, enrichment of information about theoretical and practical knowledge through provision of different difficult project and pedagogical tasks [5]. The principle of information technology potential mainstreaming (D.I. Boykov, A.V. Gerisimov, A.V. Tyurin, and

etc.) guarantees the accessibility, display corresponding needs, practical utility and scientific validity of information, and also informational technologies, including remote-sensing ones, for equal access students to qualitative education. The balance and dynamism principle (V.V Vasilkova, V. S. Lednev, T. A. Korobkova, P. V. Skulov, and others) gives an opportunity to consider the self-organization as a system feature, an inevitable consequence of dynamic interaction of hierarchy subordinate elements of inclusive education. These selected principles are multidimensional and give the ideal models and goals of teacher preparation for designing inclusive informational and educational environment, and the coordinate and movement system for bringing these goals into practice. All these principles are interrelated and they complement each other revealing the main facets of the process under research.

Exception of many functions performed by educational institutions allowed us to determine functions of teacher preparation for designing inclusive informational and educational environment. The central function is the innovation and developing one which manifests itself in the complex support of the innovation process. That is, it ensures continuity, successful interaction of all the subjects of inclusive education, and consistency of all its stages on the way to innovation implementation and getting a positive result from this implementation, and also innovation detection, choice of the most effective ones and start of the new innovation process.

The result of the innovation and developing function should be learning, using and innovation generation of theoretical and practical nature for designing inclusive informational and educational environment. The integrative and analytical function is considered as an opportunity to preserve the integrity of the information which is important for professional and pedagogical activities and academic student mobility with different educational needs, including special healthy needs, to increase success of teacher preparation for designing inclusive informational and educational environment. The main feature of the integrative and analytical function is to preserve the integrative benchmark in the educational and professional space from the point of view of University student needs as the main subject of this space. That is why educational process implies such a level and character of learning (optimal and modular) through which the development inclusive competence can be successfully realized in professional life [6]. The regulative and adaptation function of University student preparation for designing inclusive informational and educational environment is presented as creating and consolidation of the activity regulation. Their sources serve as pedagogical ideas, views, approaches which are embodied in the regulations, pedagogical literature, models of pedagogical activities. All the functions are in close cooperation with each other, turn from one to another, and are almost the single process.

III. RESULTS OF RESEARCH

The verification of the concept of teacher preparation for designing inclusive informational and educational environment was promoted through an experiment which 76 teachers took part in. The set of research methodologies was used in this experiment: self-evaluation and expert assessment of an inclusive competence, questionnaire aiming at examination of motivation to development the basis of pedagogical design; expert assessment method for identification the need to apply pedagogical design; differential project and pedagogical objectives to assess an inclusive competence; methodology for identification of independence choice of the program products, information technologies, methods and ways of meeting the project and pedagogical challenges.

We consider three parameters to identify the levels of an inclusive competence: the instrumental competences (indicators: knowledge, abilities, relations), personal and professional transaction (indicators: social connections, inclusion in project and pedagogical activities), personal characteristics (tolerance, responsibility, communication). The levels of an inclusive teacher competence were characterized on the basis of these parameters and their indicators: threshold (willingness to design the objects of inclusive informational and educational environment by algorithm and to ensure special conditions, in accordance with the regulations), basic (willingness to creating inclusive informational and educational environment and to ensure special conditions, in accordance with the regulations), advanced (psychological, pedagogical, professional and technological willingness to creating inclusive informational and educational environment and to ensure special conditions, in accordance with the regulatory requirements and individual requests of persons with special healthy needs).

The experimental work was carried out under natural conditions of Universities in stages. The indicative stage of the experimental work allowed to determine the mainstreaming level of an inclusive competence, quality of preparation for designing inclusive informational and educational environment. The conceptual model and pedagogical conditions were implemented at the forming stage of the experimental work. According to the objectives of the forming stage of the experimental work, 4 groups of the test subjects were organized: the control group (CG) and 3 experimental ones (EG) which were approximately equal in the level of an inclusive competence and parameters of preparation for designing inclusive informational and educational environment. The content block implementation of pedagogical conditions was carried out in the EG-1. The implementation of the procedural and technological block was carried out in the EG-2. The complex of pedagogical conditions, including the content, procedural and technological blocks, was carried out in the EG-3. Special measures for preparation for designing inclusive informational and educational environment were not carried out in the CG. Processing, quantitative and qualitative analysis, interpretation and presentation of the results of the experimental work were carried out at the synthesis stage (Table 1).

Table 1. The assessment of the level of an inclusive teacher competence

Group	Indicative stage			Control stage		
	threshold	basic	advanced	threshold	basic	advanced
CG	37,04%	55,56%	7,41%	14,81 %	55,56 %	29,63 %
EG-1	41,38%	51,72%	6,90%	6,90%	41,38 %	51,72 %
EG-2	42,31%	53, 85%	3,85%	7,69%	26, 92%	65,38 %
EG-3	40,00%	56,00%	3,00%	4,00%	24,00 %	72,00 %

The verification of the hypothesis was carried out with the help of φ*- criterion, χ2 - Pearson criterion. The statistically significant difference in each group, including the CG, was identified to determine difference in the distribution of the levels of an inclusive competence in the CG, EG-1, EG-2, EG-3 at the indicative and control stages with the help of χ2 - Pearson criterion. That is why the special education ensures the meaningful change of an inclusive competence. However, an experimental influence has more statistically significant impact, as confirmed by the observed values of χ2 - Pearson criterion (according to comparison of the CG at the indicative stage and the CG at the control stage χ2 of the CG is 22,86; χ2 of the EG-3 = 58,12; χ^2 of the EG-2 = 34,02; χ^2 of the EG-1 =31,87). φ* was used to confirm the results. φ* is a F-ratio test, under which the fixed observed value at the control stage between the EG-2 and CG was 4,891, between the EG-2 and CG was 2,549, between the EG-1 and CG was 2,384 (a critical value because the level of importance is P – 0,05 = 1,64, and P – 0,01 = 2,31). The observed value is above critical one, reflecting the statistically significant change of an inclusive competence in the EG-1, EG-2, EG-3 in comparison with the CG, taking into account a non-essential difference between the groups at the indicative stage of the experiment.

According to experimental data, the results confirm that the level of an inclusive teacher competence has been increasing because of the phased preparation for designing inclusive informational and educational environment. This suggests that there is effectiveness and feasibility of the practical use of the developed concept.

IV. DISCUSSION OF THE RESULTS

Informational and educational environment as a model of the informational space has the most salient functional features. That is, informational and educational environment is a space of joint training activities based on electronic and communication systems training tools in terms of communicative aspect [8]. That is why the authors emphasize the preference of the use of the term 'informational and educational environment' as a single one because some believe that it refers only the technical basis of this environment [7]. According to multidimensional informational and educational environment of higher education organization, pedagogical technologies are converted to pedagogical informational ones as the systems of material (technological) and ideal (knowledge) means which are used in training for processing, transmission and dissemination of information, and conversion of ways its presentation. The creation and development of pedagogical information technologies is a necessary condition for informational and educational environment because there technologies, on the one hand, are based on the theoretical basis of pedagogy, psychology, computer science, management, on the other hand, they use enormous opportunities of modern technology [3]. The implementation of pedagogical information technologies at Universities focuses on realization of such the main functions of informational and educational environment as the informational, integrative, communication, coordinating, developing, professional oriented, general culture humanistic ones. The creation of the effective, available and technological informational and educational environment is considered as a reasonably complicated technical objective allowed to radically modernize the technological basis of the educational system, make the transition to the open educational one which meets the requirements of the post-industrial society. However, it is important to note that the creation of informational and educational environment is not only a technical objective. It is necessary to engage the scientific and methodological, organizational, and pedagogical capacity of the whole system for its creation, development and using. Informational and pedagogical environment is considered as a systematically organized set of information, technical, training/learning provision which is connected with a person as a subject of the educational process [3]; an anthroposophical relevant informational entourage, intended for unleashing the creativity and talent of a teacher and a student [4]. According to this research, a correct definition of inclusive informational and educational environment is the single space integrating training products and computer technologies of interaction, which mediates the establishment of the educational process for students, including persons with special healthy needs, the synergetic competence system for effective professional activities and social self-realization in the information society.

The key properties characterizing inclusive University informational and educational environment are integrity, transparency, polystructure, emergence, dynamism, and synergy. These properties of informational and educational environment mediate its capacity which allowed to realize the following functions: adaptive, information, communication, integrative, developing, motivational, coordination, culture forming, professional oriented, humanitarian, humanistic, reflective, predictive, diagnostic and etc. Student preparation for designing inclusive informational and educational environment under intensive implementation of informational and communication technologies in the education depends on the character (level) of their activity in the inclusive informational and educational environment development. The higher the level of student's activity at all the stages of designing pedagogical objects, the higher the level of professional education transformation into self-education, of the mainstreaming process into self-mainstreaming, of development into self-realization.

The didactic capacity of inclusive informational and educational environment allows to achieve objective accessibility and individualization of education with the help of the means of the individual educational spaces, and also to achieve comprehensive interactivity provided by project education methodologies, coupled with informational and communication technologies at the same time. Inclusive informational and educational environment as a field of professional development determines the synergistic system of the teacher key generic, specialized and highly specialized competences for the effective professional activities in the inclusive society which is based on the new axiological benchmarks, including values of reflection and self-knowledge, values of educational, social and professional inclusion, corresponding to a relevant tendency of social development.

The creation and support of such inclusive informational and educational environment in which there is psychologically comfortable and pedagogically informed development of subjects on the basis of the most rational understanding, interaction of different types of educational resources is

considered as the key function of pedagogical design. Considering the above, designing of inclusive informational and educational environment is considered as the complex of managerial procedures for the selection of the quality education content, identification of the submission structure and means of educational products in this environment which is available for subjects of the educational process, including students with special needs. The success of designing of inclusive informational and educational environment will be defined, taking into account the mechanisms of processes and activities, understanding of a project object. It will result in an inclusive competence as an integrative ability to perform pedagogical and professional functions with high quality in the inclusive society, and to create inclusive informational and educational environment and provide special compensating life conditions of persons with special needs and disabilities [9].

The educational practice shows that information density of inclusive informational and educational environment has paramount importance for a future specialist' inclusive competence, in general, and for successful preparation for designing inclusive informational and educational environment, in particular. Information density allows to intensify interaction between pedagogical process subjects; between a subject and an information object; between a subject and the wide social space. It is important that education content can respond to different requests of pedagogical process subjects, provides guidance in the information filed, and has versatile and systemic character. However, the systemic issue manifests itself in three aspects. The first one is a system of circulating information in the information field, the second one is a systematization of information, and the last one is processing of information [7].

The theoretical and methodological analysis of academic work, own theoretical studies and experience of scientific and pedagogical activities confirm the necessity of an inclusive teacher competence, and give an opportunity to put the concept and terminology of teacher preparation for designing inclusive informational and educational environment into the scientific circulation. It is defined as the targeted activities of the educational process subject which provide the acquisition of knowledge, abilities, skills and competences for designing inclusive informational and educational environment, taking into account the mentioned features.

V. CONCLUSIONS

The basis categories of this research are pedagogical design, inclusive informational and educational environment. The basic concepts which are considered in the research are designing inclusive informational and educational environment as the complex of managerial procedures for the selection of the quality education content, identification of the submission structure and means of educational products in this environment which is available for subjects of the educational process, including students with special needs; teacher preparation for designing inclusive informational and educational environment as the targeted activities of the educational process subject which provide the student acquisition of knowledge, abilities, skills and competences for designing inclusive informational and educational environment, taking into account the mentioned features. The explicative function in the research is a definition of 'inclusive competence' which connects the pedagogical, communication, informational competences and is considered as a result of teacher preparation for designing inclusive informational and educational environment. An inclusive competence is an integrative ability to perform pedagogical and professional functions with high quality in the inclusive society, and to create inclusive informational and educational environment and provide special compensating life conditions of persons with special needs and disabilities

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