

# Digital Methods and Formation of Labor Potential

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## ABSTRACT

The article reveals the main stages of experimental work using the digital method of collecting, processing and analyzing information obtained during the educational process with students.

Updating the forms, methods and means of interaction of subjects in the designed educational environment; development of a system of activities implemented in the process of educational and extracurricular activities of the institute of curation in order to adapt students to the educational environment of professional training; development of a mechanism for involving future specialists in conscious professional and personal development; implementation of a comprehensive program for designing an individual educational route; pedagogical support of students' entry into professional pedagogical activity by means of practice-oriented methods and technologies of coaching; formation of readiness to perform the functions of the designer of the educational environment, which have been tested according to the proposed digital experimental method, are effective and can be used in the practice of a pedagogical institution of higher education.

**Keywords:** *Digital method, labor potential, professional activity, educational experiment.*

## 1. INTRODUCTION

The main tasks of the digital stage of the experimental study are: to assess the effectiveness of the traditional organization of the educational environment of training of future service professionals and to determine the initial level of readiness of future service professionals for professional activities [1, 2]. Hryhorii Skovoroda University in Pereiaslav was chosen as the site for the experimental work. The digital experiment included the following substages:

1. Selection of students in control and experimental groups.
2. Development of tasks, questionnaires and selection of methods of pedagogical diagnostics aimed at determining the indicators of value-motivational, epistemological-creative, personal-activity and digital components of readiness of future service professionals for professional activity.
3. Experimental determination of the initial level of formation of components of readiness of future specialists in the field of service to professional activity, comparative analysis of indicators of students of control and experimental groups.
4. Conducting a survey of teachers and students to assess the effectiveness of the traditional organization of the educational environment of professional training of future service professionals and the feasibility of changing the existing project of the educational environment

of vocational training by means of experimental methods.

5. Research of the possibilities of the teaching staff, indicated by the Free Economic Zone on the purposeful introduction of the methodology of designing the educational environment of professional training of future specialists in the field of service.

6. The use of mathematical and statistical analysis to determine the pedagogical conditions for successful training of future professionals in the field of service in the designed educational environment.

## 2. LITERATURE REVIEW

The digital experiment was implemented through a survey of teachers and students, observation, analysis of classes, interviews, testing, practical tasks, the use of diagnostic techniques, the method of expert evaluations, methods of mathematical statistics and more [1, 2].

Each diagnostic complex was generalized, the purpose of which is to determine the values, needs, knowledge, skills, abilities and personal qualities of future service professionals, which are obtained during the continuous pedagogical process from first to fourth year and reproduce indicators of readiness for professional activity [3, 4].

Taking into account modern psychological and pedagogical researches, it is expedient to offer features of

improvement of a technique of designing of forms, methods and means of professional training of future specialists in the field of service [5-8].

### **3. PEDAGOGICAL EXPERIMENT BY DIGITAL METHODS**

A selective research method was used to select students for the control and experimental groups. That is, in order to obtain statistically significant data, the working sample size for the control group was  $N_c = 60$ , and for the experimental –  $N_e = 60$  students.

Selection of empirical research tools (test methods) for the components of readiness of future service professionals for professional activities, as well as the formation of components of professional readiness of students of control and experimental groups was determined by developed diagnostic complexes (questions, tests, practical tasks, diagnostic techniques, results of observations, etc.). The effectiveness of experimental work on the implementation of the developed methodology was determined in stages.

After the completion of each block, students of control and experimental groups took part in the intermediate diagnosis of readiness for professional activity in accordance with the formation of components: value-motivational (VM), epistemological-creative (EC), personal-activity (PA) and digital (D).

This organization of interim monitoring was due to the need to diagnose changes in the indicators of the components of the readiness of future service professionals for professional activities in order to determine the effectiveness of the proposed forms, methods and means of training that were innovative [9, 10].

Comparison of the results of experimental and control groups on intermediate sections allowed to make mobile adjustments in the process of designing the educational environment of professional training in order to improve the performance of a particular component of readiness.

At the formative stage after the implementation of the model of professional training of future service professionals in the designed educational environment using the developed methodology, a final section of the readiness of future service professionals for professional activities was also conducted.

The task of interpreting the results of research and experimental work is realized through successive actions, which consisted of subprocesses: generalization of the characteristics of the educational environment of professional training by its subjects; establishing differences in the indicators of the formation of the components of

readiness for professional activity of students of experimental and control groups and confirming them by the results of analysis of variance; research of dynamics of formation of components of readiness of future experts in the field of service to professional activity in the designed educational environment on intermediate and final cuts; statistical processing of the obtained experimental data.

In order to determine the overall assessment of the functioning of the components of the educational environment of professional training of future service professionals, a survey of subjects of the educational environment of professional training (teachers, curators, mentors, representatives of the administrative corps, students) was conducted.

The results of the obtained data showed the changes that have taken place in the components of the educational environment of professional training of future service professionals.

The current state of the educational environment indicates that the functions of planning, development and development of new information services are being implemented, but their implementation is spontaneous; improvement of forms and methods of information interaction on the basis of local access technologies.

The designed digital educational environment provides for the creation of a holistic system that integrates educational, scientific and socio-cultural activities of teachers and students, provides free access to educational and methodological support and Internet sources, promotes motivation to work with information resources and communication technologies.

The generalization of the results of the formation of the components of the readiness of future service professionals for professional activities in the designed educational environment is presented in stages (by blocks) to fully track the dynamics of changes in indicators during all years of training.

The calculations, as during the control cut, turned out to be quite voluminous. The proposed sets of tasks students of control and experimental groups performed at different levels. Note that the results shown by students of the experimental groups were much higher than the results of the control groups.

Numerical data required mathematical processing, which was performed using the arithmetic weighted average. According to this formula, the arithmetic mean indicators of the formed indicators of readiness of future service specialists for professional activity are calculated.

#### 4. RESULTS AND ANALYSIS

The analysis of this data shows that the results of intermediate and final sections of determining the formation of indicators of the components of the readiness of future service professionals for professional activities at the university, where the study was tested, are different and have significant deviations. The results of intermediate sections after the introduction of the methodology of designing the educational environment will be analyzed by arithmetic mean and qualitative changes in the components of readiness.

After the first block of implementation of the methodology of designing the educational environment and improvement of professional training in order to adapt students to the educational environment, there have been significant changes in the results of indicators of the components of readiness for professional activity. Thus, in the experimental groups, the highest score for the VM component was - 3.5. The most significant changes took place according to the indicators: value attitude to events, people, myself; awareness of the importance of a constant learning process; the presence of interest and positive attitudes to the pedagogical activities of service professionals.

The adaptation process of students in the educational environment of vocational training was optimal due to: thorough work of the institute of curation on innovative forms and methods, adaptation to forms of distance learning and means of distance education and textbook support site, use of constructivist forms, tools and methods teaching-pedagogical support, harmonization of educational influences and scientific cooperation.

After the introduction of the second block of innovations: "Involvement of students in conscious professional and personal development in the educational environment of vocational training" and the implementation of the pedagogical condition defined in this context, the following indicators are summarized in experimental groups: VM – 3.62 and EC – 3.84.

The changes took place according to the indicators of the value-motivational component indicator: awareness of the importance of personal and professional development; increasing a positive attitude to the design of professional and personal self-development.

According to the indicators of the epistemological and creative component, the following has been improved: the ability to learn about pedagogical phenomena and processes; the development of pedagogical thinking has begun; determined the presence of strong knowledge about the organization and specifics of educational interaction in the education system; the manifestation of cognitive activity and creativity of students of experimental groups is recorded.

The highest indicator for PA is 3.73 points, which is proved by changes in the indicators of the personal-activity component: the presence of skills and abilities to organize the educational process in primary school; evaluation of their professional activity for the purpose of self-actualization and self-improvement.

The implementation of the block "Designing an individual educational route and its implementation in the educational environment of vocational training" also provided significant changes in the indicators of the formation of the components of the readiness of future service professionals for professional activities.

The implementation of a complexion program "My educational route" and the use of a system of forms, methods and tools for designing socio-cultural, educational and information-communication environments provided high performance components. The highest score on the indicators of the VM component is 3.82, EC is 3.98, PA is 3.90 points.

The changes were based on indicators: value-motivational component (understanding the importance of basic cultural values for self-realization and success; presence of interest and positive attitudes to pedagogical activity of service specialists; formation of need for professional self-realization, self-actualization; formation of pedagogical attitudes to subject-sub object interaction); epistemological and creative component (ability to learn pedagogical phenomena and processes, formulate goals of professional activity; integration of theoretical and methodological knowledge to design educational processes; ability to creatively apply acquired knowledge in solving pedagogical and educational tasks; formation of creative abilities: creative intuition, originality); personal-activity component (practical skills and abilities of organization of educational process; complexity of abilities and skills of estimation of the professional activity for the purpose of self-improvement; formation of organizational-activity qualities of the expert; development of ability to interact with subjects of educational environment; ability to generalize information by means of information technologies).

Thus, it is the integration of educational and scientific activities, the beginning of the program "Individual route of scientific work", the use of various forms and methods of scientific cooperation, participation in the project "Scientific space", launching an electronic archive of scientific publications of the Institutional Repository, participation in various Internet events and the foresight project "Catalog of World Repositories" provided an opportunity to improve the performance of indicators of indicators of readiness for professional activity: awareness of the importance of a continuous learning process; positive attitude to the design of professional and personal self-development; raising the general cultural level of

development; formation of pedagogical thinking; possession of thorough knowledge of current trends in the development of the national education system; ability to creatively apply the acquired knowledge in solving pedagogical and educational tasks taking into account specific pedagogical situations; improving the skills and abilities of organizing and evaluating their professional activities; ability to show subjective activity and self-organization, etc.

After the introduction of the system of forms, methods and means of the fifth block of innovations: "Entering quasi-professional activity in the educational environment of vocational training" the highest indicators in experimental groups are generalized: on VM component is 4.0 points, EC is 4.23, PA is 4.15.

We believe that the comprehensive implementation of the tasks of this unit made it possible to thoroughly improve the work of the institute of curation through the introduction of elements of coaching technology and student participation in the project "My future profession", improve the quality of interaction in the context of using practice-oriented forms, methods and tools, and widespread use of information technology in the information and communication environment.

The changes took place according to the indicators of the value-motivational component indicator: the need for professional self-realization, self-actualization; development of pedagogical attitudes to subject-subject interaction; awareness of the importance of humanistic values in the work of service professionals; focus on creative mastery of the profession and active future professional activity.

According to the indicators of the epistemological and creative component, the following has been improved: pedagogical thinking; system of knowledge about the essence, purpose, content, methods, forms of organization and control of educational activities, knowledge about the organization and specifics of educational interaction in the system; ability to creatively apply the acquired knowledge in solving pedagogical and educational tasks taking into account the age and individual characteristics of students.

Changes in the indicators of the personal-activity component were manifested: in the ability to comprehensively use practical skills and abilities in order to organize the educational process; manifestation of professionally significant personal qualities.

Summary of the results of digital experimental work on block 6: "Teacher - designer of the educational environment" showed the largest increase in scores on the indicators of readiness of future professionals for professional activities, in particular, in experimental groups the

highest score for VM component was 4.20. The most significant changes took place in terms of indicators: the formation of universal values; focus on creative mastery of the profession and active future professional activity; the need for professional self-realization. After this block, the highest score for the EC component is 4.40 points.

Thus, in this way the ability of future professionals to learn about pedagogical phenomena and processes, to formulate goals of professional activity and to implement them is improved; revealed the presence, system and thoroughness of knowledge about the essence, purpose, content, methods, forms of organization and control of educational activities in the free economic zone and knowledge about innovative methods and technologies in the field of higher education; implemented integration of theoretical and methodological knowledge in order to design educational processes and environments; the level of formation of creative abilities is increased (creative intuition, originality, creative looseness, etc.).

In the experimental groups the highest score was obtained for PA - 4.32. It should be noted the increase in evaluation results on indicators: independence and complexity of the use of professional skills and abilities in order to organize the educational process; availability of skills and abilities to evaluate one's professional activity for the purpose of self-actualization and self-improvement; ability to interact with the subjects of the educational environment of higher education; formation of the ability to work with information; ability to show pedagogical orientation, subjective activity and self-organization, etc.

The analysis of the results on the arithmetic weighted average of the components of the readiness of future service professionals for professional activities at the final cut in the experimental groups differs from those in the control groups.

At the same time note that the scores obtained by students in the final section are lower than in the last blocks. This is, in particular, due to the complexity of diagnosing the final cut on all indicators of components, in accordance with the requirements of the full range of values, knowledge, skills, personal qualities and abilities that are formed in the process of training future service professionals.

Thus, the highest score on the indicators of the VM component is 3.83, EC is 4.04, PA is 3.97 points. The arithmetic mean of the formation of the components of the readiness of future service professionals for professional activities in terms of the final cut is: VMe component in the experimental groups is 3.81 points, which is 76.2%, ECe is 4.01 (80.2%), PAe is 3.87 (77.4%); in the control groups: VM<sub>K</sub> is 2.69 points (53.8%), EC<sub>K</sub> is 2.86 (57.2%), PA<sub>K</sub> is 2.78 (55.6%).

To clarify, confirm the arithmetic weighted average and its reliability, we use, as at the stage of digital experiment, such a parameter of statistical distribution as variance.

The results of statistical analysis at the stage of digital experiment proved the existence of a significant difference between the indicators of the formation of value-motivational, epistemological-creative and personal-activity components of readiness for professional activity of students of experimental and control groups. Authenticity was verified using Pearson's test.

This criterion is determined for each student, so it is impossible to show all the definitions in this paper. The analysis of indicators shows an increase in the level of formation of the components of readiness for professional activity of students of experimental and control groups in all intermediate sections.

Thus, the students of the experimental groups have an indicator of the formation of the value-motivational component is within 66.4% (block 1) - 81.8% (block 6), the control group - 49.2% (block 1) - 60.0% (block 6); students of experimental groups of the epistemological and creative component - from 71.6% (block 1) to 87.2% (block 6), the control group - from 52.8% (block 1) to 64.6% (block 6); personality-activity component of students of the experimental group - from 69.2% (block 1) to 85.2% (block 6), control group - from 51.2% (block 1) to 62.4% (block 6).

Analysis of the results of the arithmetic weighted average in the final section shows that the level of formation of the components of readiness of future service professionals in the experimental groups can be described as high, in the control - medium, in particular, the value-motivational component is: in the experimental group 76.2%, in the control - 53.8% (difference 22.4%), epistemological and creative: in the experimental group 80.2%, in the control - 57.2% (difference 23.0%), personal activity: in the experimental group 77.4%, in the control - 55.6 (difference 21.8%).

At the same time, the decrease in the final slice compared to the intermediate slice of the sixth block of innovations is justified by the complexity of diagnosing this slice for all indicators of components, while intermediate slices for indicators: "possession of systemic knowledge in the specialty", and within the academic disciplines studied at a certain stage of professional training.

To summarize the results of experimental research, a comparison of the indicators of the formation of the components of readiness for professional activity was done, obtained in the process of digital and formative stages of the experiment.

Thus, in the final section, the indicators of the formation of the components of readiness for professional

activity in students of experimental groups differ significantly from the section and indicators of the control groups.

Analysis of the results of determining the levels of formation of the studied readiness proves the effectiveness of the digital method of designing the educational environment and its impact on the quality of training of future service professionals, because the experimental groups at the end of the experiment is dominated by students with a high level of readiness - 48.3%, which is 21.8% more than the number of students in control groups with this level; there is a difference in low-level indicators: experimental group 12.7%, control - 21.0%.

Comparing the levels of readiness of future service professionals for professional activities, identified in the experimental groups at the digital and formative stages of the experiment, it can be stated that the proposed method of designing an educational environment for future service professionals, which was implemented based on the developed training model, designed environment, provided improving the quality of training of future professionals in a particular field.

This is evidenced by a significant decrease in the number of students in experimental groups with a low level of manifestation of this readiness by 73.6% and an increase in the number of students with an average level of its manifestation by 25.3% and high level - by 48.3% compared to the experiment.

Thus, there is significant positive dynamics at all levels of manifestation of readiness of students of experimental groups for professional activity.

Changes in the control group took place also, as the existing educational environment under the traditional system of vocational training is effective, but the changes in indicators are not so significant. Thus, the number of students in control groups with a low level of readiness for professional activity decreased by 66.7%; and an increase in the number of students with a high level of manifestation - by 26.7%.

Thus, the comparative analysis of the results of experimental work showed the dynamics of the readiness of students of experimental groups for professional activity and thus confirmed the importance of designing an educational environment for future training of service professionals based on the developed methodology and its integrated implementation.

Updating the forms, methods and means of interaction of subjects in the designed educational environment; development of a system of activities implemented in the process of educational and extracurricular activities of the institute of curation in order to adapt students to the educational environment of professional training; development of a mechanism for involving future specialists

in conscious professional and personal development; implementation of a comprehensive program for designing an individual educational route; pedagogical support of students' entry into professional pedagogical activity by means of practice-oriented methods and technologies of coaching; formation of readiness to perform the functions of the designer of the educational environment, which have been tested according to the proposed digital experimental method, are effective and can be used in the practice of a pedagogical institution of higher education. The forms, methods and means of professional training of future service specialists in the conditions of the designed educational environment were determined.

We substantiate the expediency of their choice and characterize them in the context of the implementation of tasks - improving the innovative project of the educational environment of professional training of future service professionals.

The main organizational forms of education are lectures, practical, laboratory, seminar classes, independent work of students and educational projects. These forms of education have different goals and opportunities for the formation of individual components of students' readiness for professional activity. Thus, during the lecture there is a significant impact on the epistemological and creative component, because students form professional knowledge. Practical training has somewhat wider opportunities to influence not only the epistemological-creative, but also personal-activity (knowledge, skills and experience of professional activity) and motivational-value (experience of emotional-value attitude to their profession, to themselves, to students, to society).

The information and communication environment is formed by media lectures (slide lectures, hypertext lectures with links to media objects); seminar-chat; video conference (webinar); asynchronous seminar; virtual practical and laboratory workshops (implemented by means of universal or developed computer models); online conferences; internet projects; internet conferences; individual or group work on the basis of the forum; chat; e-mail; video conferencing; Skype and so on.

In order to implement the tasks of independent work it is recommended to use educational-research, search and practice-oriented tasks both traditional (reviewing, analysis and generalization of literature, crossword puzzles) and innovative (project activities (individual, pair and group projects), creating presentations, portfolio, case preparation, etc.).

Promising is the formation of a cloud-based environment based on the Moodle platform, which allows the modernization of information and communication infrastructure, development of new pedagogical technologies, bringing the process of training future professionals to modern requirements of science and practice.

## 5. CONCLUSIONS

Overall, the design of the educational environment for the training of future service professionals involves the integrated use of teaching aids. Complexity reflects a scientific approach to the planning, development, creation and use of the optimal system of teaching aids required for complete and quality training within the allotted time and relevant content.

Thus, these proposals based on modern forms, methods and means of training are a means of improving the methodology of designing an educational environment for future professionals and are designed to generalize a system of provisions that determine the effectiveness of forms, methods and tools for designing an educational environment for future professionals. services for the formation of labor potential.

The presented scientific results of the research do not cover all aspects of the complex and multifaceted problem of digital design of the educational environment of professional training of future specialists.

Future development of the theory and practice of designing the educational environment can be carried out in the following areas: application of elements of the developed methodology of designing the educational environment in the training of specialists in other specialties; comparison of the effectiveness of the introduction of different digital models of the educational environment in the practice of pedagogical institutions of higher education; research of self-realization of the personality in the designed environment, etc.

## REFERENCES

- [1] I. Olsson, T., Huhtamäki, J., H. Kärkkäinen, Directions for professional social matching systems, *Communications of the ACM* 63(2) (2020), 60-69. DOI: <https://doi.org/10.1145/3363825>
- [2] D. Alt, Science teachers' conceptions of teaching and learning, ICT efficacy, ICT professional development and ICT practices enacted in their classrooms, *Teaching and Teacher Education* 73 (2018), 141-150. DOI: <https://doi.org/10.1016/j.tate.2018.03.020>
- [3] S. Koval, Application of employment and logistics concepts in professional training of service specialists, *Professional education: methodology, theory and technologies: Collective Science* 7 (2018) 140-154.
- [4] S. Koval, A. Bielova, Professional aspects of the market of Ukraine, *USEFUL online journal* 3(1) (2019) 39-47. DOI: <https://doi.org/10.32557/useful>
- [5] R. Nureev, V. Volchik, W. Strielkowski, Neoliberal

Reforms in Higher Education and the Import of Institutions. *Social Sciences*, 9(5) (2020), 79. DOI: <https://doi.org/10.3390/socsci9050079>

[6] OSVITA.UA (2014) Strategy for reforming higher education in Ukraine until 2020. [http://osvita.ua/doc/files/news/438/43883/HE\\_Reforms\\_Strategy\\_11\\_11\\_2014.pdf](http://osvita.ua/doc/files/news/438/43883/HE_Reforms_Strategy_11_11_2014.pdf) Accessed on 22 Jan 2021

[7] V.S. Vasylychenko, A.M. Grynenko, O.A. Grishnova and others, *Management of labor potential: textbook*, KNEU, 2005, 403 p.

[8] L. Shipun, Top 5 most popular professions abroad. <http://ua.comments.ua/life/199607-top5-naybilsh-zatrebuvanih-profesiy-za.html> Accessed on 20 Jan 2021

[9] V.S. Shovkalyuk, Problematic issues in the creation and operation of science parks in Ukraine. [http://eep.org.ua/files/2010\\_Наукові\\_парки.pdf](http://eep.org.ua/files/2010_Наукові_парки.pdf) Accessed on 20 Jan 2021

[10] V.G. Shcherbak, Modeling of the innovative level of development of labor potential of the transport industry, *Communal economy of cities: scientific and technical*, *Sat KhNUGH* 75 (2007), 20–32.