Asesorías y Tutorías para la Investigación Científica en la Educación Puig-Salabarría S.C.
José María Pino Suárez 400-2 esq a Lerdo de Tejada. Toluca, Estado de México. 7223898475
RFC: ATI120618V12

Revista Dilemas Contemporáneos: Educación, Política y Valores.
http://www.dilemascontemporaneoseducacionpoliticayvalores.com/
Año: VII Número: Edición Especial Artículo no.:52 Período: Octubre, 2019.

TÍTULO: Transformación digital de la educación pedagógica en la Federación Rusa.

AUTORES:

1. Ph.D. Elena Zotikovna Vlasova.
2. Cand. Ph.D. Svetlana Viktorovna Goncharova.
3. Cand. Ph.D. Vladimir Polikarpovich Barakhsanov.
4. Assist. Prof. Ekaterina Alekseevna Ivanova.
5. Cand. Ph.D. Natalya Aleksandrovna Karpova.
6. Senior Lect. Tatyana Sergeevna Ilina.
7. Eng. Aleksandra Stepanovna Sysoeva.

RESUMEN: El artículo muestra que la transformación digital de la educación pedagógica es un proceso complejo esencial de transformación de todos sus componentes bajo la influencia de tecnologías avanzadas. El propósito del artículo es identificar tendencias en la transformación de la educación pedagógica en el contexto de la evolución de la economía en la dirección de la digitalización. El estudio del problema se llevó a cabo mediante la observación de la dinámica del desarrollo del proceso de formación de futuros maestros, el experimento pedagógico y los métodos de estadística matemática. El estudio demostró la promesa de la transformación digital de la educación pedagógica y la eficacia de la aplicación de nuevas soluciones digitales y tecnológicas en formación docente para una escuela digital.

PALABRAS CLAVES: docente, transformación digital, educación pedagógica, adaptación.

TITLE: Dıgıtal transformatıon of the pedagogıcal educatıon in the Russıan Federatıon.

AUTHORS:

1. Ph.D. Elena Zotikovna Vlasova.
2. Cand. Ph.D. Svetlana Viktorovna Goncharova.
3. Cand. Ph.D. Vladimir Polikarpovich Barakhsanov.
4. Assist. Prof. Ekaterina Alekseevna Ivanova.
5. Cand. Ph.D. Natalya Aleksandrovna Karpova.
6. Senior Lect. Tatyana Sergeevna Ilina.
7. Eng. Aleksandra Stepanovna Sysoeva.

ABSTRACT: The article shows that the digital transformation of pedagogical education is an essential complex process of transformation of all its components under the influence of advanced technologies. The purpose of the article is to identify trends in the transformation of pedagogical education in the context of the evolution of the economy in the direction of digitalization. The study of the problem was carried out using observation of the dynamics of the development of the process of training future teachers, pedagogical experiment, and mathematical statistics methodsthe study proved the promise of the digital transformation of pedagogical education and the effectiveness of applying new digital solutions and technologies in teacher training for a digital school.

KEY WORDS: teacher, digital transformation, pedagogical education, adaptation.

INTRODUCTION.

Education has passed into a phase of significant transformations caused by the global digitalization of society. In order to be effective, pedagogical education must change rapidly, and in order to be among the leaders, it is necessary to change at a faster pace.

The previous educational models and methods for their implementation are not sufficient, the old methods of communication between the participants of the educational process often do not work, the types of students' activities, models of getting and working with knowledge change. Pedagogical universities need to develop a strategy for their development in the context of the dynamic digital transformation of inclusive education. In virtue by, it is pedagogical education that is at the heart of all innovations, the progressive development of modern society and the economy directly depends on the effectiveness of digitalization processes in this particular sector of education.

For a number of years (since 2012), in the Herzen State Pedagogical University of Russia (St. Petersburg) and the Ammosov North-Eastern Federal University (Republic of Sakha (Yakutia)) experimental work is carried out: 1) to identify trends in the transformation of pedagogical education in the context of the evolution of the economy in the direction of digitalization; 2) to create new models and technologies for training teachers, focused on the trends of the digital transformation of education. The experiment was attended by bachelor students, undergraduates (the direction of “Pedagogical Education”) and teachers from various faculties of the Herzen State Pedagogical University of Russia and the Ammosov North-Eastern Federal University.

DEVELOPMENT.

Literature review.

Issues of digital literacy, digital education are relevant in the modern information society. Foreign researchers focus on the problems of developing the digital competence of students and teachers

(Caitlin McMunn Dooley, Tisha Lewis Ellison, Meghan M. Welch, Mindy Allen, 2016; Martínez, E. P., & Sánchez-Caballé, A. (2017)., 2017; Rockinson-Szapkiw, A., Wendt, J., Whighting, M., & Nisbet, D. (2016).;), the use of digital education in higher education (Juan Antonio Gutierrez Gomez, Jose Luis Serrano Sanchez, 2018; Perez-Escoda, Ana and Castro-Zubizarreta, Ana and Fandos-Igado,, 2016). In particular, the author of the work (Al-Samarraie, H., Teng, B. K., Alzahrani, A. I., & Alalwan, N. 2017) explores the issues of student and teacher satisfaction with e-learning systems offered by higher education institutions.

Researchers analyze the experience of using modern visual tools: infographics, video content (Bernard R. Robin., 2016), the possibility of using network tools in e-learning (Imran A.S., Pireva K., Dalipi F., Kastrati Z., 2016), the use of AI methods in e-learning (Seth A. Parsons, Margaret Vaughn, Roya Qualls Scales, Melissa A. Gallagher, Allison Ward Parsons, Stephanie G. Davis, Melissa Pierczynski,, 2017). Many studies compare students' perceptions of digital and non-digital feedback modes in higher education (Tracii Ryan Michael Henderson Michael Phillips, 2019). Western authors provide examples of methods for assessing the readiness of students in higher educational institutions to solve professional problems using digital learning technologies (Gunter, G. A., and Reeves, J. L., 2017; Lorna Arnott Ioanna Palaiologou Colette Gray, 2018).

The problem of the quality of education in a constantly changing world is described in detail in the writings of one of the leaders of the Worldwide CDIO Initiative (Kamp, A, 2016). Considering the positive aspects of a new flexible type of training, many researchers note the disadvantages that are considered in (Yang CY., Chung TY., Hwang MS., Li CY., Yao JF.J. (2017), 2017). In many studies, various aspects of the changing nature of the pedagogical need for innovative electronic information-educational environments are discussed (Schulz, Renée, Ghislain Maurice Isabwe, and Frank Reichert, 2014).

At the same time, the analyzed works do not sufficiently reflect the problem of the digital transformation of pedagogical education to improve the quality of professional training of future teachers and create their digital assets.

The theoretical foundations of the study were the works of Russian authors in the use of adaptive (Barakhsanova E. A., Savvinov V. M., Prokopyev M. S., Vlasova E. Z., Gosudarev I. B., 2016; Aksyutin P.A., Goncharova S.V., Ilyina T.S., 2017; Tarkhov S.V. 2005), e-learning (Vlasova E.Z., 2010; Aksyutin P.A., Vlasova E.Z., Gosudarev I.B., Zhukov N.N. 2015;Aksyutin P.A., Vlasova E.Z., Gosudarev I.B., Karpova N. A., Zhukov N. N. 2016;Aksyutin P.A., Goncharova S.V., Karpova N.A. 2017;. Vlasova E.Z. 2018;Vlasova E.Z., Gosudarev I.B., 2015;Vlasova E.Z., Goncharova S.V., Luknova V.A. 2017), information technology (Goncharova S.V. 2017;Ivanova E.A., Sysoeva A.S., Voitin E. 2018;Ilina T.S. 2016;Karpova N.A. 2012; Aksyutin P.A., Goncharova S.V., Karpova N.A. 2017, 2019), the use of modern visual tools and infographics (Vlasova E.Z., Ivanova E.A., 2017; Vlasova E.Z., Ivanova E.A., Sysoeva A.S., 2018; Ivanova E.A., Sysoeva A.S., Voitin E. 2018, 2018).

Materıals and methods.

In the conditions of the new digital economy, pedagogical education cannot work according to the old model and with the previous efficiency, using traditional processes, methods, educational technologies, and tools. Drivers of change are the modern students and schoolchildren, as well as changes in their preferences for the form of work with students, ways of obtaining knowledge, and options for interaction with the educational environment. The study analyzed the overall picture of strategic changes in specific pedagogical universities of Russia in recent years. Many important factors have been identified, which are obstacles and drivers in the process of change for the time being. Technological trends and directions for the development of teaching capital, competences, and vocational pedagogical education are identified. In total, the study involved over 200 teachers

and over 900 students. In addition to electronic surveys, the results of individual and group interviews conducted personally with the respondents were used in the structure of the experiment. Teachers aged from 24 to 70 years participated in the study. Bachelor and master students took part in the survey.

Results.

The research participants set a goal not only to qualitatively prepare students for educational startups that have emerged in the conditions of the emerging digital transformation of the university, but also to motivate them to actively use new tools for learning, self-learning, and implementing new adaptive educational activities.

First-year students of the Herzen State Pedagogical University of Russia and Ammosov North-Eastern Federal University studying "Pedagogical education" were the study objects. After completing the study of the "Information Technology" discipline, bachelor students were asked to answer the question: "Do you think that studying a discipline using a wide range of digital technologies has contributed to your training as teachers of a new digital format?" For all the years of the experiment, only definite answers were received. Separately, it should be noted that all respondents emphasized the effectiveness of learning in an adaptive digital educational environment (ADEE), including the elements of AI (https://inftech.spb.ru).

In the process of reflection, the overwhelming majority of students focused on the fact that they were allowed to write their impressions of the work in the environment, on the provided digital interactions, services, and tools. In turn, teachers based on this information have the opportunity to engage in the study, analysis, and management of student experience. Using this as a platform for their methodological growth and the creation of new educational solutions and technologies for the new digital educational reality. Teachers developed the environment in the department of computer technology, and e-learning of the Herzen State Pedagogical University of Russia is focused not only

on the interdisciplinary adaptive training of future teachers to use the didactic and developmental potential of digital educational technologies but also on the design of their professional activities, professional interaction with various remote agents (students, colleagues from the professional community) (Vlasova E.Z., Goncharova S., Aksyutin P., Barakhsanova E.A., Prokopyev M.S., Kuzin Z., 2018; Barakhsanova E. A., Vlasova, E.Z., Golikov A. I.; Kuzin Z. S., Prokopyev, M.S., Burnachov A. E., 2017).

Every year, students who completed the study of the discipline were asked to answer the question: “Do you consider it expedient from the point of view of your professional development as a teacher of a new digital format to study digital services, tools and technologies with the purpose of using them in relation to solving problems of professional activity”? At the significance level □ = 0.02 (□ = 0.98), the hypothesis of equality of the shares of the characteristic was tested, namely, the authors tested hypothesis that the students of the Herzen State Pedagogical University of Russia and Ammosov North-Eastern Federal University consider it expedient to study digital services, tools and technologies for the purpose of their use in relation to the tasks of professional activity and, as a result, their development as teachers of the new digital format.

The study was also attended by teachers from two universities who are actively integrating digital technologies into their professional activities. They were asked to answer the question: “Which of the listed characteristics of the digital transformation of the university do you consider most significant for its development in the conditions of the new digital reality?” Arrange them in order of importance”. The hypothesis was tested that the correlation between the two ordered groups of characteristics in the sample of the Herzen State Pedagogical University of Russia and the Ammosov North-Eastern Federal University is statistically significantly different from zero (that is, the opinions of teachers from two universities on the studied issue are similar). To process the results, the Spearman's rank correlation method was used.

Based on the theoretical analysis and study of the trends in the development of modern Russian pedagogical education, it was shown that the new digital reality in education brings many problems that need to be solved. These are the need and, at the same time, the unwillingness of the mobile to develop new technologies and systems; lack of personnel, extraordinarily intelligent and talented young people; rapid training of specialists for the development of new "digital" specialties in education. At the theoretical and practical level, the feasibility of using digital services, tools and technologies in the process of forming and developing the readiness of future teachers to work in a digital educational environment that integrates the innovative achievements of the digital society has been confirmed. To solve this problem, a unique adaptive digital educational environment adapted to solving professional-pedagogical tasks has been developed, including elements of artificial intelligence (Vlasova E.Z., Avksentieva E.Y., Goncharova S.V., Aksyutin P.A. , 2019). Its effective use in the educational process is confirmed by specific results obtained after processing the experimental data. The results of surveys by year are presented in Table 1.

Table 1. Survey resultsThe Herzen State Pedagogical University of Russia and the Ammosov North-Eastern Federal Universityin 2012-2019.

Year	students The Herzen State Pedagogical University of Russia		students The Ammosov North-Eastern Federal University		Statistics, t
	General number n_1	Answered "Yes" m_1	General number n_2	Answered "Yes" m_2	
2012	119	79	105	65	0.699
2013	123	69	102	71	-2.081
2014	120	73	112	82	-2.001
2015	124	81	106	79	-1.512
2016	109	86	105	89	-1.111
2017	120	112	111	101	0.664
2018	121	99	115	105	-2.128
2019	117	107	121	110	0.148

$$w_1 = \frac{m_1}{n_1}, \qquad w_2 = \frac{m_2}{n_2}, \quad (1)$$

Where m_1 and m_2 mean the number of elements of the first and second samples with the studied indicator. Statistics t (for each year) was calculated by the formula

$$t = \frac{w_1 - w_2}{\sqrt{p(1-p)\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}, (2)$$

where p is calculated by the formula

$$p = \frac{m_1 + m_2}{n_1 + n_2} . \quad (3)$$

The significance level $\alpha = 0{,}02$ received the values of $t_{кр} = 2.33$, which were found using the tables. Since

$$|t| < t_{кр}, \quad (4)$$

This is the hypothesis that the students of the Herzen State Pedagogical University of Russia and Ammosov North-Eastern Federal University consider it equally expedient to study digital services, tools and technologies with the aim of using them in relation to solving problems of professional activity and their professional development as a teacher of a new digital format in all cases. Besides, the creative content of the master's programs “Technologies and management of e-learning” and “Corporate e-learning,” the practical organization of the educational process with the active use of digital technologies, tools, and services allowed to obtain highly positive results of professional training of students based on modern digital technologies. This is confirmed by long-term observations of the results of successful professional work of graduates of these educational programs in the digital environment of the school.

In order to assess the significance of the digital transformation of teacher education, teachers from two universities were asked to analyze and rank the characteristics of the digital transformation of the pedagogical university. The data obtained were averaged over 24 subjects, and the averages were ranked. Table 2 presents the ranking indicators of the characteristics of the digital transformation of the pedagogical university. There are 12 of them. They were used to find the Spearman's rank correlation coefficient rs = 0.944. The formula calculates it

(5)

There is a positive correlation between the views of students of two universities on the issue under study at the significance level □ = 0.05, since tcalc. □ tcr. (9.052 □□2.23). t - student statistics, which is used to make a decision, is calculated by the formula

(6)

The relationship between the views of master students at two universities is statistically significant at the 5% level of significance.

$$r_s = 1 - \frac{6\sum d_i^2}{n(n^2-1)} \quad (5)$$

There is a positive correlation between the views of students of two universities on the issue under study at the significance level $\alpha = 0.05$, since $t_{calc.} > t_{cr}$. (9.052 > 2.23). t - student statistics, which is used to make a decision, is calculated by the formula

$$t = |r_s| \sqrt{\frac{n-2}{1-r_s^2}} \quad (6)$$

The relationship between the views of master students at two universities is statistically significant at the 5% level of significance.

Table 2. Ranking indicators of the characteristics of the digital transformation of the pedagogical university

Characteristics	Rank in the RSPU sample	Rank in the NEFU sample	d	d^2
Optimization of the educational process	3	3	0	0
Makes the university more adapted to the target audience.	6	5	1	1
Improving the competitiveness of the university in the market of pedagogical education	11	9	2	4
Readiness for fundamental shifts towards the educational system of a new generation	10	10	0	0
Increase the efficiency of interaction between departments at the level of the entire educational institution	2	2	0	0
The possibility of transition to a new educational model	9	8	1	1
Online access to educational information	1	1	0	0
Development of new forms of education	8	11	-3	9
Provides the opportunity to share lessons learned and knowledge	5	6	-1	1
It stimulates training with the necessary competencies for modern digital education	7	7	0	0
It allows students to learn better training practices using ICT	4	4	0	0
Get a synergistic effect from the addition of traditional educational formats of digital education	12	12	0	0

The most significant results include the development of fundamentally new content of the "Information Technologies" discipline for bachelor degree students majoring in "Pedagogical Education." It is adapted to the professional activity of a teacher in a digital school environment, filled with theoretical and practical issues of using digital educational technologies, tools, and services that are relevant for the preparation of teachers of the new digital format.

Teaching the discipline is carried out in the conditions of active use of ADEE with the AI elements integrated into it and artificial intelligence-based programs for independent communication with students. Bachelor students who have completed training in this discipline are motivated to continue exploring options for using digital technologies and AI methods in their training and to create their digital assets to solve didactic and methodological problems. It should be noted, that students show a sustained interest in developing their options for working with schoolchildren following the trends of the digital transformation of education.

Students are designing digital homework, offering options for visibility, and interactivity using simulators, designing options for personalization of learning based on digital technologies, offering teaching methods for blended learning. Their current activity position confirms that the digital transformation of pedagogical education contributes to the solution of the actual problem of modern pedagogical education - the preparation of a new digital format teacher.

Dıscussıon.

Pedagogical education in Russia traditionally strives for advanced educational technologies and breakthrough educational strategies, but for the time being, this is not embodied in such a large scale that the authors would like to observe.

One of the main problems that currently exists is the lack of qualified teaching staff with the required competences in the field of digitalization of education and specifically e-learning. In order to overcome this, pedagogical universities need to reform the training of future teachers, the system

of raising the qualifications of already working teachers and teachers of pedagogical universities, who will continue to be actively engaged in the digital transformation of teacher and school education. Higher education institutions become leaders in development, whose leaders at the level of department heads purposefully and systematically initiate teachers to study the tools of the digital teacher and integrate them into their professional activities, strive to develop an innovative culture for the entire teaching team and the need to move forward in a coordinated manner.

The most significant and exciting result is that the main driver of change is the modern student. Their education is changing under the influence of new factors. That is why digital transformation is an inevitable process that modern pedagogical education is undergoing, adapting to the new conditions and preferences of the digital economy society. Digital transformation is not only a change in educational technologies but also a change in thinking and culture in the teaching staff. Highlight several critical areas of the digital transformation of pedagogical education:

1. It is necessary to understand that the modern student is included in the digital world almost from birth. Studying its educational needs is a critical direction in the digital transformation of pedagogical education. Only with this approach can one be effective tomorrow, respond to changes in the market of educational services. A student today, where (s)he is on time, conveniently, comfortably, and quickly provides the opportunity to join in obtaining new knowledge and show how it works. Accordingly, an educational institution needs all the tools and the ability to adapt to the rapidly changing culture of learning and learning. A modern student is interested not only in a set of acquired knowledge but in the process of interaction with a teacher through dialogue; the degree of development and mobility of the digital educational environment, with the help of the means, tools and technologies of which it can carry out the activities in which it is included.

2. It should be borne in mind that digital transformation is based on the principle of open education and flexible integration. This allows the educational organization to find new non-standard

breakthrough solutions in the development of its educational activities at the expense of collaborations and integrations with other educational partner organizations. Such interactions make it possible to quickly and efficiently test and bring to the market of educational services, entirely new educational products and services (educational programs, technologies, methods, etc.).

Digital partnership is becoming one of the essential factors of scaling, which allows educational organizations, regardless of geography and presence, to conduct an educational process anywhere in Russia or another country.

3. It is advisable to develop and use standard knowledge bases and electronic educational resources.

4. It is necessary to search and introduce innovations. Thanks to digital technology, modern education is experiencing a transition from a model of preliminary pedagogical design to a model of constant pedagogical experimentation. In educational institutions, it is advisable to form centers for digital educational innovation based on flexible methodologies. They regularly work on finding and testing new directions for the development of pedagogical education, educational products, and solutions based on digital technologies.

With the help of digital technologies, pedagogical universities have received a new field for competition outside the market of their educational services - the ability to complement and expand their audiences by teaching new students and students, to provide operational support to students almost around the clock using e-learning and distance learning technologies.

CONCLUSIONS.

The study resulted in the fact that the digital transformation of pedagogical education is one of the most critical areas that will help to make a new technological breakthrough in the education system as a whole. Educational institutions that today will not engage in the digital transformation of their activities will be ineffective tomorrow and may disappear under the pressure of new realities on the educational services market and more pragmatic “digital” competitors from education.

The authors substantiated that the digital transformation of pedagogical education is a necessary, strategic, controlled process of change in pedagogical education. It includes a set of transformations through the introduction of an innovative digital culture in an educational institution, the adaptation of models and learning technologies to the digital realities of life and learning, the widespread use of publicly available knowledge bases and electronic educational resources, intensive and focused training of teachers for changes in their work, their educational role, process and equipment of their workplace.

Based on the experiment, which considers the analysis of regional practices, the advantages of digital transformation to pedagogical universities are revealed, and a specific example shows that training a teacher of a new digital format requires substantial, procedural and instrumental changes in the educational process itself.

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DATA OF THE AUTHORS.

1. **Elena Zotikovna Vlasova**, Doctor of Sciences (Pedagogy), Professor, the Head of the Information technology and e-learning department, Herzen State Pedagogical University of Russia, Saint-Petersburg, Russia. elenavlasova557@yahoo.com
2. **Svetlana Viktorovna Goncharova**, Candidate of Sciences (Pedagogy), Associate Professor of the Information technology and e-learning department, Herzen State Pedagogical University of Russia, Saint-Petersburg, Russia.

3. **Vladimir Polikarpovich Barakhsanov**, Candidate of Sciences (Pedagogy), Research Assistant Professor, Institute of Physical Culture and Sports, M.K. Ammosov North-Eastern Federal University, Yakutsk, Russia.
4. **Ekaterina Alekseevna Ivanova**, Assistant of the Information technology and e-learning department, Herzen State Pedagogical University of Russia, Saint-Petersburg, Russia.
5. **Natalya Aleksandrovna Karpova**, Candidate of Sciences (Engineering), Associate Professor of the Information technology and e-learning department, Herzen State Pedagogical University of Russia, Saint-Petersburg, Russia.
6. **Tatyana Sergeevna Ilina**, Senior Lecturer of the Information technology and e-learning department, Herzen State Pedagogical University of Russia, Saint-Petersburg, Russia.
7. **Aleksandra Stepanovna Sysoeva**, engineer of the Information technology and e-learning department, Herzen State Pedagogical University of Russia, Saint-Petersburg, Russia.

RECIBIDO: 8 de septiembre del 2019. **APROBADO:** 22 de septiembre del 2019.