MODERN TEACHING TECHNOLOGIES

СУЧАСНІ ПЕДАГОГІЧНІ ТЕХНОЛОГІЇ

ADAPTIVE EDUCATIONAL WEB-ENVIRONMENT AIMED AT ENSURING THE ACTIVITIES OF SUPPORTING EDUCATIONAL INSTITUTIONS OF THE DEPRESSIVE REGION (ZHYTOMYR) IN THE CONDITIONS OF EDUCATIONAL NETWORK OPTIMIZATION

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The article defines the terms "web-environment", "adaptive web-environment", "educational space", "depressed region".

It is noted that the study is based on the ideas of three approaches - systemic, environmental and resource-managerial. The systemic approach is represented by the components of the educational environment – the scientific and material base, the subject-based activities, which take place in the adaptive educational web-environment. The resource-managerial approach balances the interests, abilities and capabilities of the participants of the educational process with the requirements of society in accordance with 21CS. The implementation of tasks is conditioned by the use of the environmental approach, which combines, complements and concretizes our chosen approaches.

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The following stages are allocated for the project implementation: development and creation of an adaptive web-environment; introduction of an adaptive web-environment into the educational process.

Forms of work include the following: e-learning (synchronous and asynchronous), blended / hybrid learning, including inverted classroom, gamification, block-module learning, integrated learning, educational partnership, educational mousses (involvement of an unlimited number of educators, participation of EI in programs / courses); online network "Creative Spark" (involvement of gifted youth), brain club "Go Create" (regional cooperation in the educational web environment in the field of the latest digital technologies), online consultations, master classes.

The following methods are proposed: teleconference, project, digital technologies, public presentations of ideas in the context of "Lesson with built-in diagnostics", "Lesson in a specialized school", "STEAM lesson", "STEM lesson".

Key words: *adaptive web-environment, educational space, depressed region, supporting educational institutions.*

АДАПТИВНЕ ОСВІТНЄ ВЕБ-СЕРЕДОВИЩЕ ДЛЯ ЗАБЕЗПЕЧЕННЯ ДІЯЛЬНОСТІ ОПОРНИХ ЗАКЛАДІВ ОСВІТИ ДЕПРЕСИВНОГО РЕГІОНУ (ЖИТОМИРЩИНИ) В УМОВАХ ОПТИМІЗАЦІЇ ОСВІТНЬОЇ МЕРЕЖІ

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У статті дано визначення понять "веб-середовище" та "адаптивне веб-середовище", "освітній простір", "депресивний регіон".

Зазначено, що в основу дослідження покладено ідеї трьох підходів – системного, середовищного та ресурсного. Системний підхід представлений компонентами освітнього середовища – науково-матеріальною базою та суб'єктами, діяльність яких відбувається в адаптивному освітньому веб-середовищі. Ресурсний підхід дозволить збалансувати інтереси, здібності та можливості суб'єктів освітнього процесу з вимогами суспільства до 21CS. Реалізація завдань зумовлена використанням середовищного підходу, який об'єднує, доповнює та конкретизує обрані нами підходи.

Виділено для реалізація проєкту такі етапи: розробка та створення адаптивного веб-середовища; упровадження в освітній процес адаптивного веб-середовища.

Форми роботи: e-learning (синхронне та асинхронне), змішане/гібридне навчання, зокрема перевернутий клас, гейміфікація, блочно-модульне навчання, інтегроване навчання, освітнє партнерство, освітні муси (залучення необмеженої кількості освітян, участь ЗО у замовленні програм/курсів); онлайн-мережа "Creative Spark" (залучення обдарованої молоді), мозковий клуб "Go Create" (регіональне співробітництво в освітньому веб-середовищі у сфері новітніх цифрових технологій), онлайн консультації, майстер класи.

Пропоновані методи: телеміст, проєкт, цифрові технології, публічні презентації ідей в контексті "Урок з вбудованою діагностикою", "Урок у профільній школі", "STEAM урок", "STEM урок".

Ключові слова: *адаптивне веб-середовище, освітній простір, депресивним регіон, опорні заклади освіти.*

Introduction of the issue. Web-environment is a powerful tool in the system of educational communication. It becomes a necessary prerequisite for further development of educational institutions of depressed regions (on the example of Zhytomyr region), increasing their rating and competitiveness in terms of optimizing the educational network.

Adaptive web environment is a conscious form of educational activity in the region, which combines educational resources with popular independent Internet resources and operates in the mode of daily updating and

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replenishment of information [6]. At the same time, *it provides for Internet communication* (the main criterion is quality and simplicity); *integration of a virtual education department* and *serves as the universal educational portal with support for continuous e-learning*; *ensures the realization of enlightening function of education.*

Moreover, web environment serves as a means of saving funds on the development of the network of educational authorities, as it takes over some of the functions of various educational units. It is being *implemented* through a system of "personal accounts", *organizes* open access to educational opportunities (certification programs, grants, internships, exhibitions, conferences, seminars, databases of theoretical and didactic materials, scientific publications, etc.) and *provides* communication with domestic and world scientific professional community; it also *promotes* informal communication between educators and the formation of new ties, integrating teachers of educational institutions of depressed Zhytomyr region in the modern educational space of Ukraine and Europe.

Current state of the issue. According to art. 9 of the Law of Ukraine "On Stimulating the Development of Regions", the definitions of "depressed region" implies the area that is or was affected by the Chernobyl accident / is or was highly polluted / is border / in which there is extremely weak development of the transport network and other elements of the infrastructure. Zhytomyr region meets all these criteria. Additional characteristics are the following: population reduction (including the number of administrative units), optimization of the educational network, significant distance of some schools from the center of the region. A separate factor is the forced transition from traditional to blended (distance) learning, which causes inequality in access to education, especially for the population of remote areas.

An adaptive web environment in such a region can provide:

- *monitoring* the educational interests of territorial communities, including their educational needs;

- *verification* and *ensuring* the quality of educational services, their advertising and promotion (encourages the subjects of the educational process to act in conditions of fierce competition and deteriorating demographic situation);

- *positioning* of educational institutions of the depressed region and *maintaining* their image (initiates communication flows, exercises control over them at the level of identification of the institution as a real object, visualization of its image, symbolic representation, etc.);

- *managing* relationships with consumers of educational services (expanding and maintaining a regular audience, implementing loyalty programs, creating an effective feedback system, digital public and educational space, presentations, press conferences, press releases, "virtual" tours of educational institutions).

The analysis of research in the field of education showed the priority of development and implementation of innovative ICTs and modern approaches to the development of digital space of modern school, which includes creating a web environment to optimize the educational process. Some research has been done in this direction. In particular, under the scientific supervision of O. Antonova a dissertation research on the development of information and communication mobility of teachers in the educational e-environment has been defended; a number of articles on the use of digital technologies in the educational environment of higher education has been published (2019) [2]; the use of Google services in organizing group work on computer science with gifted students has been investigated (2019) [1]; research on the development

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of IR mobility of teachers in postgraduate education has also been reviewed (2019) [3]. O. Vlasenko, V. Pavlenko studied the problems of digital civic space in the modern school: from teacher to creative leader (2020) [7].

In recent years, there has been an increase in the interest of scientists in the use of ICTs in the educational process, therefore significant experience has been gained while studying the impact of ICTs in various parts of the education system; moreover, the introduction of distance learning technologies in education has been studied by V. Bykov, M. Zhaldak, V. Kukharenko, V. Lapinskyi, H. Raikovska, O. Spivakovska, Yu. Tryus, M. Sherman. Didactic and psychological-pedagogical aspects of the use of computer technology in the educational process are discussed in the works of Ye. Barakhansova, T. Voloshyna, N. Morze, Ye. Nelunova, V. Riabtseva, O. Spirin and other. The main aspects of computer and distance learning have become the subject of research by V. Kushnir, S. Sysoieva, O. Karelina, A. Tymchenko. Theoretical and practical bases of creation of open distance courses are developed by V. Oliinyk, O. Samoilenko, Ye. Smyrnova-Trybulska.

Problems of functioning of depressed territories are considered in the works "Mechanisms of rehabilitation of depressed territorial social systems in the context of regional policy formation" (Shevchuk Ya., 2004), "Foreign experience in providing state support for capacity development of potentially lagging behind and depressed territories" (Matviishyn Ye., Niema O., 2009), "Depressive territories: ways to get out of crisis" (Hovorukha V., Diehtiar A., Mamonova V., 2008) and other.

Among foreign scholars, the following areas have been covered: M. Ribble's "Digital Citizenship" (2017), M. Ribble, M. Park's "Digital Citizenship Handbook for School Leaders: Fostering Positive Interactions Online" (2019); L. Jones and K. Mitchell "Defining and measuring youth digital citizenship" (2016) are devoted to general issues of the digital space; J. Schwanholz, T. Graham, P.-T. Stoll – "Managing Democracy in the Digital Age: Internet Regulation, Social Media Use, and Online Civic Engagement. Springer" (2017), which explores the issues of Internet regulation, the use of social networks and public participation in the web environment. The role and place of non-governmental organizations in the construction of the digital space was investigated by E. Gordon in his work "Civic Organizations and Digital Technologies in an Age of Distrust" (2019).

Scientific research of B. Gleason, S. Gillern entitled "Digital Citizenship with Social Media: Participatory Practices of Teaching and Learning in Secondary Education" (2018) and C. Greenhow, B. Robelia, J. Hughes with their "Learning, teaching, and scholarship in a digital age Web 2.0 and classroom research: What path should we take now?" (2009) focuses on the integration of digital space into the content of school education. A. Goodwin's study "Globalization, global mindsets and teacher education" (2020) reviewed the young people's understanding and perception of globalization processes and their impact on adolescent behavior.

The experience of N. Lopina and L. Zhuravliova in creating an informational and educational web-environment of the clinical department of a higher medical education institution (author's certificate of N. Lopina, Zhuravliova L., 2019) was used as a role model by the authors in the process of creation of their own project [6].

Outline of unresolved issues brought up in the article. However, despite the significant amount of research on digital space in modern school, issues of systematic and practical implementation of digital space concepts and the choice of tools and means for its use have not been sufficiently studied in

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the domestic sector of pedagogical research and are not properly integrated into the curriculum.

The logic of further scientific research involves going beyond a separate educational institution and creating an adaptive educational web environment at the regional level, thus the depressed Zhytomyr region has been chosen as the role model for the research purposes.

Aim of research is to develop proper tools for modeling the vector of development as well as psychological and pedagogical support of the subjects of the educational process in multidimensional space.

Results and discussion. In Ukraine, the problem of development of educational institutions in terms of optimizing the educational network requires urgent measures to address it. This issue is especially relevant in depressed regions, where the quality of educational services and the results of educational management have serious shortcomings that must be rectified, therefore, creating a positive image of a modern teacher and support institution for potential consumers of educational services becomes a priority, as well as improvement of management of relations with them, including feedback analysis.

Aiming to contribute to global and regional challenges to improving the quality of education requires acting in the context of agreed international and Ukrainian goals to promote education and sustainable development, thus, given the specifics of domestic education reforms that make assessing the quality of education, keeping up with the development of ITC is identified as a key element of effective management decisions. At different levels the main idea in the development and implementation of an adaptive web environment for assessing and managing the quality and results of education in depressed Zhytomyr region is clearly seen, which allows to:

- improve existing or develop new tools for measuring the level of quality of knowledge;
- develop new strategies for using data on educational outcomes in order to improve its quality;
- explore the vectors of curricula aimed at filling gaps in awareness and understanding in accordance with the 21CS concept;
- take into account the recommendations of PISA, PIRLS on the establishment of a program of strategic measures to improve literacy, strengthen the education system as a whole and determine the level of quality of education in order to eliminate gaps, taking into account the needs of depressed areas.

The Agenda for Sustainable Development in Europe (Objective 4) stipulates that by 2030 all countries must "ensure inclusive and equitable quality education, creating equal opportunities for all for lifelong learning" (UNESCO, 2015). Leading countries have already joined the program, in particular the UK government has launched a policy of integrating e-learning into educational institutions "on a sustainable basis" since 2009 (Mackeogh & Fox, 2009). The first model of e-learning in education (Guodong & Zhongjiao, 2010) was the "Chinese Education and Research Network" (CERNET, 1994) [2]. Thus, the analysis of national e-learning strategies and its implementation in EI is strategic and determined by two goals: to improve the skills of the population to solve pressing problems of society, and to develop flexible accessible learning environment under the circumstances of constant changes in society and lifelong learning system.

We consider the adaptive educational web-environment as a set of information blocks and tools for working with several segments of the target audience (teachers, managers, parents, the public) [5]. Therefore, the strategy of development of support institutions of

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education in the depressed region in terms of optimizing the educational network will depend on what information and tools will be used and what types of target audience segments will be involved, as well as their interaction with each other.

An adaptive educational web-environment allows to build effective relationships with consumers and the educational community, so the Internet component is part of the strategy for the development of the depressed Zhytomyr region.

Creating a positive image of a modern teacher and support institution for potential consumers of educational services should begin with the *organization* and *systematic development* of communication with students, their parents, teachers, school administration, NGOs, the public and other consumers of educational services through careful step-by-step *monitoring*. Assessing the quality of education will help to improve learning outcomes (effective 21CS acquisition, citizenship, participation in social and cultural life and further employment) through comprehensive interventions related to equality, cessation of bullying, mobbing, etc., creating a harmonious educational environment and improving teachers' qualifications.

Undoubtedly, the main result of pedagogical monitoring is the creation of a *metric scale* (test scores obtained from different segments of the audience, data on the success of certain test tasks), which opens the opportunity to quantitatively compare students' achievement, parents' aspirations, the relative degree of mastery of the elements or sections of the curriculum, and ensuring objectivity in making managerial and pedagogical decisions.

At the same time, the desire of educators to reveal the internal logic of the educational process (concept, implementation, phasing, relevance) is adequate, which allows not only to measure learning outcomes, but also to qualify them within a certain level scheme (EdHelp monitoring).

The project is based on the ideas of three major approaches namely: systematic, environmental and resource managerial. The systematic approach is represented by the components of the educational environment – the scientific and material base, including subjects with related activities taking place in the adaptive educational web environment. Resource managerial approach balances interests, abilities and capabilities of the subjects of the educational process with the requirements of society to 21CS, which allows rational adjustment of external and internal resources of the individual on the basis of ideas of humocentrism, personal orientation and individual development through the formation of rational structure, appropriate responsibilities, the use of innovative forms of labor organization. The implementation of the above-mentioned tasks is due to the use of an environmental approach that combines, complements and concretizes chosen approaches.

Forms of activities: e-learning (synchronous and asynchronous), blended/hybrid learning, including inverted classroom, gamification, block-module learning, integrated learning, educational partnership, educational mousses (involvement of an unlimited number of educators, participation of EI in ordering programs/courses); online network "Creative Spark" (involvement of gifted youth), brain club "Go Create" (regional cooperation in the educational web environment in the field of the latest digital technologies), online consultations, master classes.

Proposed methods: teleconference, project, digital technologies, public presentations of ideas in the context of "Lesson with built-in diagnostics", "Lesson in a specialized school", "STEAM lesson", "STEM lesson".

Tools and means: digital platforms Trello, Milanote, Basecamp and others

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The project implementation involves the following stages:

Stage 1. Development and creation of adaptive web environment.

Content of the stage: to clarify the current educational problems of the depressed region on the basis of the developed monitoring of the activities of support schools and local communities in the context of educational problems; to conduct pilot experiments, control sections in order to create a model of adaptive web environment.

Expected results: integrated multifunctional web resource – Interregional Analytical Platform for Interaction in Education / ICEA – Interregional cooperation in education analytics aimed at information support, control, optimization of the educational process and ensuring the activities of educational institutions in the depressed region for their optimal socio-educational development and steady growth in the quality of educational services;

- EdHelp monitoring model for analysis of current educational problems in the depressed region.

Stage 2. Implementation of adaptive web environment into educational process.

Content of the stage:

– to introduce an integrated multifunctional web resource – Interregional analytical platform for interaction in education / ICEA – (interregional cooperation in education analytics) into the educational process of depressed regions of Zhytomyr region and check its effectiveness.

Expected results:

- tools of information-analytical interaction, the availability of ready-to-use software products that allow to organize communication – a process of varying complexity, simplicity and comfort:

- pool of tasks of the tool of monitoring of academic and subject achievements of students in the conditions of transition to specialized training (full cycle on development of test tasks, carrying out of pilots and approbations, psychometric research and validation of test material);

- a system of contextual questionnaires (for teachers, parents, cross-interview questionnaires) to analyze the results of student monitoring);

- software for processing the received information, its storage for correlation of personal vectors of development (video lectures, webinars, master classes, advanced training courses, trainings);

- personal accounts and chats;

- pool of analytical information for the educational community.

The core of the project is, first of all, *Polissia Educational-Research-Production Complex*, created on the basis of Zhytomyr Ivan Franko State University, which unites 24 educational institutions of Zhytomyr region and is a prerequisite for creating an adaptive web environment. Scientific resources include the scientific school "*Professional and pedagogical training of future teachers*", research centers and laboratories, namely the *Scientific and Methodological Laboratory "Educational System of Polissia"*, the *Center for Creativity of Personality*, *Scientific and Methodological Center for Gifted Youth*. The material and technical base of the project includes the resources of structural units of the Faculty of Physics and Mathematics, in particular, the Department of Computer Science and Information Technology; database department; computer-equipped classrooms, etc.

The result of the project should be an integrated multifunctional web resource – ***Interregional Analytical Platform for Interaction in Education / ICEA – Interregional cooperation in education analytics*** aimed at information support, control, optimization of the educational process and support of educational institutions in the depressed region. educational development and sustainable growth of the quality of educational services.

An important place among the results takes the following: *the monitoring*

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(*EdHelp*) of the support institutions of depressed areas, *enlightenment* (Creative Spark, Go Create, webinars, networking, workshops), *counseling support* for the institutions in depressed regions, *implementation* of NUS ideas for secondary and high school.

The results of experimental work include collection, processing, storage of monitoring information; construction and comparative analysis of vectors of educational subjects; definition and interpretation of a number of systemic indicators; visualization of results, preparation of information and analytical materials for the educational community; NGOs; a wide range of consumers of educational services; achievements of a sufficient level of readiness for managemental decisions by the educators.

The **universality** of the adaptive web-environment will be ensured, which enables it to be used at all levels of education (from the smallest units of administrative-territorial organization (village, city, region, region) to the national level)

Interregional cooperation platform in education analytics / ICEA – Interregional cooperation in education analytics is an integrated multifunctional web-resource for:

• **monitoring** (cycles of training seminars and webinars for teaching and administrative staff, local communities interested in the practical use of tools);

• **expansion of the pool of tasks of the tool for monitoring** of educational and subject achievements of schoolchildren in the conditions of transition to profile training (full cycle on development of test tasks, carrying out of pilots and approbations, psychometric research and validation of test material);

• **development** of a system of contextual questionnaires (for teachers, parents, cross-interview questionnaires) to analyze the results of monitoring of students' achievements);

• **enlightenment** – the creation of software for processing information received, its storage, which identifies correlations and patterns of personal development vectors (video lectures, webinars, workshops, refresher courses, training);

• **counseling** – organization of feedback with the help of personal accounts and chats;

• **analytical information bank** for the educational community.

Regional education authorities receive the results of monitoring the quality of learning, taking into account the full range of EdHelp tools (including diagnostics of levels of learning content, forecasting, assessing the quality of teaching staff) and recommendations for changing the vector of the educational process individually by class, educational institution, community.

Educational institutions receive recommendations to change the educational process to improve the quality of educational outcomes. Educators master the technology of in-school and in-class monitoring of the quality of learning. During the trainings, each teacher develops his / her own technology for assessing the quality of learning, receiving a certificate of retraining (teacher-facilitator, advisor-consultant, assessment expert, researcher, content facilitator, technologist, designer, manager-administrator, etc.).

EdHelp tools allow to analytically assess the readiness for STEAM, STEM, specialized training in accordance with the NUS reform.

Main feature of EdHelp is an integrated diagnostic mechanism that provides information about the quality of learning the content of the curriculum. EdHelp model can be implemented on the basis of various school subjects, including profile; EdHelp is designed to organize, improve and support the educational process in EI, e.i. the outcome of each class can be assessed, as well as the contribution of each class to the overall average score.

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Within the activities of the educational and scientific complex "Polissia" (order of the Ministry of Education and Science of Ukraine № 480, dated from 15.06.2004), the founders of which include Zhytomyr Ivan Franko State University into the designed educational environment. Therefore, coordination of joint activities of educational institutions of Zhytomyr region, current issues of education and training of applicants, training of scientific and pedagogical staff, conducting and implementing research results, development of instructional materials, etc. are being carried out in the above-mentioned institution, which is considered the core of the network. The adaptive web-environment is a center for uniting educational institutions in remote regions and providing them with qualified informational and educational, learning and methodological assistance, implementation of state requirements for teacher training and professional development, professional integration of the educational community in adverse epidemics. The experience of functioning of the adaptive educational web-environment can be used for implementation in different regions of Ukraine.

Conclusions and research perspectives. Expected socio-economic effect is the following:

• no need to travel (saving fuel costs, depreciation of vehicles, time, etc.), as the web-environment allows to work remotely;

• safety for health in the conditions of quarantine restrictions;

• saving costs for the publication of information and methodological materials (placement on the platform);

• the possibility of using designed resources in other regions of Ukraine;

• improving the quality of educational services by attracting experienced teachers to the web-environment;

• effective use of training areas and technical means, concentrated and unified presentation of information, use and development of computer modeling should reduce the cost of training and significantly improve the quality of training;

• simultaneous access to many sources of educational information, a large number of students, communication between students and teachers through telecommunications;

• involvement of experienced teaching staff for the preparation of information and methodological materials and didactic tools and the use of the most modern educational and methodological materials.

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