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**INTERNATIONAL COMPARATIVE ANALYSIS OF NATIONAL STATE ELECTRONIC
EDUCATIONAL PLATFORMS FOR SCHOOLCHILDREN**

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Abstract

Developing electronic educational platforms for organizing the education of schoolchildren in different countries are considered. The purpose of the study was to conduct a comparative analysis of national electronic educational platforms by parameters: the organizational structure of electronic educational platforms, the functionality of user interfaces, educational data analytics programs, the possibilities and directions of using the results of educational data analysis. The paper actualizes the issues of the need to develop a new field of pedagogical knowledge – “Pedagogy based on data”. The new field of knowledge is aimed at the development of methodology and technologies for the analysis of educational data, which is accumulated in the form of students’ “digital traces” on electronic educational platforms.

Keywords

Data Driven Pedagogy – Electronic educational platforms – National educational systems

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Introduction

The twenty-first century is called the data age. The fourth industrial revolution is based on a cross-cutting technology for all industries — bulk data technology. Digital transformation processes have been activated in many countries around the world. States are moving to data-based management principles. New areas of professional training are emerging in the professional education systems in such countries – a big data analyst, a big data technology specialist. Public and private e-learning platforms and educational data analysis services are being designed in national education systems.

Data analysis technologies are becoming a new tool for transforming learning based on the principle of personalization, improving the educational system effectiveness and managing education systems at different levels of education. Educational policy is increasingly based on educational analytics.

International analysis of the results of information technology development indices' calculating in world countries and public administration is based on the following data:

a) Networked Readiness Index¹– (a comprehensive indicator of the level of information and communication technologies' development in the world);

b) Global Information Technology Report in the Digital Economy²;

c) E-Government Development Index, EGDI³

It demonstrates progress in the development of electronic and data-based management technologies in many countries around the world. International analysis of educational policies of the countries and management decisions on the development of educational systems (international research SABER“System Assessment and Benchmarking for Education Results”⁴ demonstrates the correlation between the digitalization of education and the possibility of its personalization to maximize the satisfaction of educational needs and individualization of educational routes, respectively, as well as the quality of educational results (Schools: evaluation and self- evaluation⁵).

Regarding the dynamics of the quality of educational results in the countries based on the results of international research (OECD PISA⁶) it can be assumed that there is an "indirect" correlation between infrastructure - technological development in the countries'

¹ Networked Readiness Index. Available at: <https://digital.gov.ru/ru/activity/statistic/rating/indeks-gotovnosti-stran-k-setevomu-obshestvu/#tabs|Compare:Place>

² The Global Information Technology Report in the Digital Economy. Available at: http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf

³ E-Government Development Index. EGDI. Available at: <https://digital.gov.ru/ru/activity/statistic/rating/index-razvitiya-elektronnogo-pravitelstva/#tabs|Compare:Place>

⁴ System Assessment and Benchmarking for Education Results (SABER). <https://www.air.org/project/world-bank-system-assessment-and-benchmarking>

⁵ Schools: evaluation. Available at: <https://www.ciep.fr/sites/default/files/migration/en/bibliography/docs/bibliography-schools-evaluation.pdf>

⁶ Programme for International Student Assessment (PISA). OECD. Available at: https://www.oecd.org/pisa/pisaproducts/PISA2021_TechnicalStandards.pdf

education sector (Index“Global Information Technology Report in the Digital Economy”) and the countries’ results in the international research “OECD Programme for International Student Assessment” (PISA) – by the top twenty countries in the PISA and IGITR rankings (based on the index of local online services - Local Online Services Index, LOSI⁷and technical, content aspects of websites and online services provided). Regarding the education sector, the above-mentioned connections are described in the study "Changes in the social situation of pedagogical activity in the conditions of schoolchildren’s digital traces development and educational data analysis"⁸.

The Boston Consulting Group (BCG) research «Target competency model 2025: from personnel to talents») recommends to reform education and management⁹. For the evidence - based development of education based on big data analysis, competent personnel are needed. Yet, in addition to the personnel aspect, the infrastructure and technology aspect is important in this task — the development of electronic educational platforms.

In order to study electronic educational platforms in the countries, we conducted an international comparative analysis.

Methods

The study uses the methodology of structural and functional analysis of electronic educational platforms for schoolchildren from all over the world. The structure of e-learning platforms was studied in the context of the structural analysis: interface of the e-learning platform for users (parents, students, teachers, administration), the structural sections of e-learning platforms (user's personal account, the results of educational achievements' diagnostics, digital portfolio, e-learning tutorials, scripts, e-lessons, etc.). In the context of functional analysis, the authors studied: what schoolchildren’s "digital traces" the electronic educational platform works with, what data form the basis of pedagogical activity on the electronic platform, where and whom the educational data is used by.

Findings

A structural and functional analysis of the technological infrastructure of digital open data in education, electronic educational resources and services for processing big data in education was carried out basing on the study of thirteen electronic educational platforms from nine countries, such as:

–PES–Russian electronic school¹⁰;

–MES– Moscow electronic school¹¹

⁷ Government-Survey. Available at: <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018>

⁸ Fiofanova, O.A. The social situation changing of pedagogical activity in the context of the development of digital traces of schoolchildren and the analysis of educational data. Social Sciences. Multidisciplinary Digital Publishing Institute (MDPI). 2020.

⁹ The Boston Consulting Group. Resetting the Talent Balance. Available at: https://www.bcg.com/Images/Russia-2025-report-RUS_tcm27-188275.pdf

¹⁰ Russian Electronic school. Available at: <https://resh.edu.ru/>

¹¹ Moscow Electronic school. Available at: <https://www.mos.ru/city/projects/mesh/>

- Kundelik – Electronic school of Kazakhstan¹²;
- NIS-Kazakhstan Nazarbayev Intellectual schools¹³;
- SCHOOLS.BY – Belarusian electronic school¹⁴;
- Pidruchnik– Electronic school of Ukraine¹⁵;
- Scho Dennik – Electronic school of Ukraine¹⁶;
- EKOOL – Electronic school of Estonia¹⁷;
- ESIS – Electronic school of Germany¹⁸;
- Frog Education– Electronic school of Great Britain¹⁹;
- EdLounge – Electronic school of Great Britain²⁰;
- Tieto Education Learning – Electronic school of Finland²¹;
- 17zuoye – Electronic school of China²².

E-learning platforms were analyzed according to the following criteria: electronic educational platform's description, structure, user interface, data types and their functional application in the practice of pedagogical solutions.

Two Russian schools: Russian electronic (RES) and Moscow electronic school (MES) were allocated. RES (<https://resh.edu.ru/>) provides both open access to its resources, as well as requires registration and offers a full school course of lessons from the best teachers in Russia. It is an informational and educational community that unites students, teachers and parents and provides equal access to high-quality general education regardless of socio-cultural conditions.

At the same time, MES (<https://www.mos.ru/city/projects/mesh/>) requires personal privacy settings; the platform is accessed via a username and a password. The RES structure includes the following sections: subjects; classes; for the student; for the teacher; for the parent; for the school. The MES educational platform contains information about MES, sections for teachers, for parents, for students, and media. The user's interface in MES also includes administration; in RES it includes only students and teachers.

¹² Kundelik. Available at: <https://portal.kundelik.kz/ru/>

¹³ Kazakhstan Nazarbayev Intellectual schools. Available at: <https://www.nis.edu.kz/>

¹⁴ SCHOOLS.BY. Available at: <https://schools.by/>

¹⁵ Pidruchnik. Available at: <https://www.pidruchnyk.ua>

¹⁶ Scho Dennik. Available at: <http://shodennik.ua>

¹⁷ EKOOL. Available at: https://ekool.eu/index_en.htm

¹⁸ ESIS. Available at: <http://www.esis.de/>

¹⁹ Frog Education. Available at: <https://www.frogeducation.com/>

²⁰ EdLounge. Available at: <https://www.edlounge.com/>

²¹ Tieto Education Learning. Available at: <https://www.tieto.com/en/who-we-serve/public-sector/education/tieto-education-learning/>

²² 17zuoye. Available at: <https://ucenter.17zuoye.com/>

RES contains information only for teachers: for teachers, it includes interactive lessons, a work program for each subject, lesson summaries, exercises and test tasks on the topic, laboratory works. Students can find interactive lessons, exercises on the topic, additional materials (a film, a virtual museum, etc.) on the site. Unlike RES, MES allows parents to keep track of their child's progress, to track homework, to ask the teacher a question, to clarify the schedule, to analyze changes in the child's performance, and to access the library of electronic materials. Students use MES as an educational diary, there is an online library and a virtual laboratory. For teachers, it is an electronic journal and a diary, an extensive library of electronic materials and scripts. It is important to note that the teachers can post lesson scenarios, and students can attach answers in the chat and take training tests.

Special attention should be paid to electronic educational platforms in Kazakhstan. "Kundelik"²³ is a project of an automated information system of electronic journals and diaries "Kundelik" for secondary schools in Kazakhstan as the main web version of the system, working with a browser on personal computers and smartphones, free for all users. First of all, it is intended for teachers, students, parents, and government employees of the educational system. The data is presented both in an open format and in a format that requires registration.

The structure of this electronic platform represents a greater diversity than the sites of e-learning platforms of Russia and includes such aspects as: an electronic diary, Kazakhstan schools maps, the memo on summative rating for a section and summative rating for a term/quarter estimation, students' psychology, children's safety, informational education, supplementary education (tutoring, workshops and courses), school digest (news, standards, discussions), educational system of Kazakhstan (all the information on the system of primary, secondary and higher education), inclusive education. The website of the educational platform contains a business card, with a presentation of the administration, contacts, news, legal and other documents, ads, photo gallery, forum; schedule and lessons; electronic journal; homework management module; reports of educational institutions. The section for parents coincides with the Russian MES platform, there is also an electronic diary for every child, homework tracking.

However, this platform has an additional option of daily notifications about the child's achievements and important school events. Students can use the diary, the online library, the portfolio, and the chat to communicate with other students, which is not represented on the Russian MES platform. An important area of this section is the informational section for education system employees — statistics, a business card of a regional or local educational authority, mass transmission of personal messages with official information.

The next electronic educational platform in Kazakhstan, "Nazarbayev Intellectual schools" (<https://www.nis.edu.kz/>), is a platform for intellectual schools that serve as an experimental platform for developing, monitoring, researching, analyzing, testing and implementing modern models of educational programs at the following levels: primary school (including pre-school education and training), secondary school, and high school. All data is presented in an open format.

²³ Kundelik. Available at: <https://portal.kundelik.kz/ru/>

The content of the e-learning platform includes the history of intellectual schools, a map of intellectual schools in Kazakhstan with a description of each school, the content of education in such intellectual schools, the media service, projects (for example, such as: Summer school, 'TEDx NIS' club, Nauryz meetings, discover Kazakhstan competition), education updates (sharing experience, professional development).

It is important to note that in addition to teachers, students and parents, the platform is aimed at applicants for training and graduates. One can find advanced training courses, information for attracting foreign teachers, system-methodical complexes on certain subjects here. For parents, there is a parent school, regulations, information about transition and school announcements. For students, there is a summer school, elective courses (at home and abroad), 'Olympiad' competitions, regulations, students' achievements and announcements.

Applicants are informed about the rules and results of the competitive selection, samples of tasks for admission, trial testing and an online training course. Graduates are granted access to a separate platform of the public association Alumni Nazarbayev Intellectual Schools.

The Belarusian site "SCHOOLS.BY"²⁴ is the least informative, it's a project of electronic journals and diaries in Belarus. The platform presents only electronic diaries and journals, a website for the school, a service for parents, 'documents and partners' section, and the I-class school simulator. Only demo versions of the product are presented in the open format. To get information, one needs to connect the educational institution to the platform and log in to one's personal account. The platform is designed for teachers, students, and parents. Teachers are presented with a modern school website, an electronic service for adding information about progress and its analysis, and notification of parents. Parents can monitor the child's progress through the child's diary, view the analysis of progress in graphical form, get acquainted with school news, and communicate with the teachers. Students can use a diary, a table of progress, and have the opportunity to communicate with classmates and teachers online.

Ukraine is represented in our analysis by two sites "Pidruchnik" (<https://www.pidruchnyk.ua>) and "SchoDennik"²⁵. As for the first electronic educational system – it is a single information space that unites all participants of the educational system, which can also function as a mobile application. The system is free of charge and is intended for students, parents, and administration. The e-learning platform includes: an electronic schedule, an electronic diary, and an electronic journal. An important feature of this platform is access to electronic textbooks in all the subjects.

Only the product description is presented in an open format. To get information, one needs to connect the educational institution to the platform and log in to one's personal account using your username and password. Privacy is maintained, and the child and parent can't see their classmates' scores. Teachers have the opportunity to track information about progress and analyze it, to post an electronic curriculum, and to write a notification for parents. Parents can view their child's diary, to analyze their progress, and to get an electronic schedule. Students use an electronic diary and an electronic schedule on the platform.

²⁴ SCHOOLS.BY. Available at: <https://schools.by/>

²⁵ Scho Dennik. Available at: <http://shodennik.ua>

"SchoDennik" is a nationwide free school educational network for teachers, students, parents and administration. The site structure includes sections that differ from the previous platforms analyzed, such as: education, communication, management, security, and accessibility. Only the product description is presented in the open format. Registration is possible only by invitation codes. There are personal privacy settings, login needs a username and a password.

This electronic educational platform provides the teachers with the teacher's electronic journal, a library (educational literature, audio and video), create personal pages for teachers with the possibility of correspondence, thematic groups and events, communication between schools, storage and exchange of documents, photos, audio, video and other files, and a school website. Parents, like on all previous sites, are provided with an electronic diary, personal pages of parents with the possibility of correspondence. The only feature is the 'School announcements' section. Students can view the lesson schedule, the electronic diary, homework, work with the library of fiction, library with educational literature, as well as with audio and video files, dictionaries and online translators, and create personal pages of students with the possibility of correspondence.

Among Estonia's e-learning platforms, the 'EKOOL' platform is of great interest²⁶; it is the first and largest online educational information platform in Estonia, which serves as a school management tool that unites students and their families, schools and administration, as well as the education system employees. The structure of the platform is revealed through completely different sections, such as "About EKOOL", functionality, customer schools, cost, and contacts. Only the product description is presented in the open format. There are personal privacy settings, login needs a username and a password.

The functional filling of this platform is the most complete and diverse in its content. For teachers, there are reports, management of students' absences and being late, storage and exchange of educational materials, description of the lesson and homework for the teacher, students and parents on one record, space for communication with students and parents, and an electronic diary. For parents, there is a weekly report (analytical summary), schedule and brief description of lessons, homework, communication with teachers and other parents, notifications of absence ("School pass patrol", in which the parent receives a notification of the child's absence from school), an electronic journal, access to the purchase of educational materials through the online store. For students, there is communication with teachers, grades and absences, schedule, homework, access to educational materials. For the administration, there is statistics and reporting, storage and exchange of educational materials, archiving and storage of data, creation, maintenance and completion of the school year, students' moving on to the next class. "EKOOL" differs from other analyzed platforms because it also includes a section "For the government", where mandatory reporting and statistics collection, school enrollment and distribution, statistics on school difficulties and their prevention, and data transfer to state repositories are presented.

For further analysis of the e-learning platforms' functioning experience in the world, e-learning platforms in Germany, Great Britain and Finland were also selected. Germany is represented by the «ESIS» e-learning platform (<http://www.esis.de/>), which is an information system for students and parents.

²⁶ EKOOL. Available at: https://ekool.eu/index_en.htm

This e-learning platform is intended for teachers, students, parents, administration, and employees of the education system and includes such sections as “About ESIS”, connection technology, and description. Only the product description is presented in the open format. Personal privacy settings are provided; login is via a username and a password. The platform allows teachers to track and record students’ absences and lateness, provides a description of homework, provides space for communication with students and parents, and presents an electronic diary and teacher’s electronic plan. Students can communicate with teachers, track grades and absences, and have access to schedules and homework.

A key feature of this e-learning platform is a section designed for parents, where in addition to the lesson schedule, homework, communication with teachers, absence notifications and an electronic journal, there is a possibility to attach the child’s sick list, to book meetings with the teacher, to select optional subjects, to pay through the ESIS Pay system (the school can send an automatically generated link for payment when sending a parent’s email), and there is also a translation function, which translates parents’ letters into eight different foreign languages.

A system that allows you to create individual educational programs, regardless of the method of teaching the child “EdLounge”²⁷, intended for teachers and students, also operates in the UK. It involves constant communication with a mentor and is designed for children who do not attend school, for gifted students and those who need help in learning the material. An important component of the British virtual educational environment EDLounge is the EDFlix system, which allows you to record sessions of online communication with the teacher, all his tips and suggestions and add them to the library. There are personal privacy settings on the site and one can also log in using a username and a password.

The functional content of this electronic educational platform differs significantly from the electronic educational platforms of Russia and the CIS countries. It includes virtual classes and distance learning; involving children with special educational needs into the school learning process; individual training programs; pedagogical analysis of staff performance; assessment and management of the class; development of practical classes; tracking the students’ progress, setting individual goals; applications for passing and preparing for exams; training through gamification resources; documentation tracking and creating; coursework creation, projects, and portfolios; creating cards and badges for the students; and a secure system for logging in to the school content and management.

«Tieto Education Learning» is a Finnish e-learning platform for students, teachers and parents that helps teachers improve the quality of their teaching work by automating repetitive tasks, improving the quality of measurements, and allowing them to personalize student learning. As with all platforms, there are personal privacy settings, and one can log in using a username and a password. The section for teachers allows them to take into account the unique needs of each student and to intervene early, especially if a problem occurs, helps them communicate with parents, students and colleagues. The information provided on the site helps the students complete tasks, comments on grades, student attendance, and promotes creating study plans through the app. The platform can help the administration automate such processes as resource planning, class planning, student grouping, communication, and reporting.

²⁷ EdLounge. Available at: <https://www.edlounge.com/>

Asia is represented in our study by the Chinese e-learning platform "17zuoye", which is created for teachers, students and parents and is aimed at improving learning efficiency and converting students' homework from offline to online. As with all the platforms, personal privacy settings are provided, and one can log in using a username and a password.

The e-learning platform allows you to synchronize the school progress, covering learning scenarios such as exercises, assessments, etc. Using big data and education technologies such as artificial intelligence, the platform allows teachers to reduce workload and increase efficiency, and allows the students to develop an interest in learning. It also allows the parents to experience pleasant emotions, so that learning would seem a wonderful time. "Learn together" is a home education platform designed for individual learning. Based on Socrates' educational technology, the intelligent learning system provides training for out-of-school learning options to help students and parents understand themselves, to organize targeted and effective learning.

An important feature of this e-learning platform is the fact that it functions as a social educational platform that adheres to the concept of "know what responsibility is, do good". The primary and secondary school platform unites young people, public organizations and interested businesses to help educational institutions in the areas with limited resources achieve a high-quality distribution of resources and help a balanced education.

Discussion

Thus, the comparative analysis has shown the diversity of electronic educational platforms in Russia and the world, both in structure and functional content. For Russia, Belarus, Ukraine, Estonia and Finland, the electronic educational platform is created primarily as an information network, where an electronic journal and a diary are placed, parents have the opportunity to track homework, the access to a library of electronic materials is provided to some extent. The electronic educational platforms in Kazakhstan allow applicants to study the rules and results of competitive selection for educational organizations, view samples of tasks for admission, pass a trial test and an online training course. E-learning platforms allow teachers to take advanced training courses on current competencies. There is also a summer school for students on the e-learning platform, as well as elective courses, as well as 'Olympiad' competitions to attract children with special educational needs to the school process. The e-learning platform systematizes educational data in the form of students' digital portfolio. Since there are no global regulations on the structure and functions of e-learning platforms, the issue of standards for e-learning and analysis of educational data is still debatable.

Conclusion

Thus, the study of the technological infrastructure of electronic educational environments and digital open data in education, electronic educational resources and services for processing big data in education and children's development allowed us to characterize the structure and functions of electronic educational platforms, their diversity in national educational systems. The study updated the lack of international standards and regulations of the functioning of electronic educational platforms and services for analyzing educational data.

Given the variety of content, advantages and disadvantages of the e-learning platforms presented, it is impossible, and we did not set such a goal, to identify the best or most effective e-learning platform, since the analysis was carried out on the platforms of nine countries, each of which has its own national and educational criteria for evaluating educational achievements and regulations for working with educational data, opportunities and prospects for development in the national educational systems of the countries.

In the future, we plan to conduct an international analysis of national databases of educational statistics using the following examples: <http://qesdb.cdie.org/ged/index.html> OECD Database, USA educational statistics database (NCES) <http://nces.ed.gov/index.asp>, <http://www.nationmaster.com/cat/edu-education>, national educational database (NOBD) of the Republic of Kazakhstan <https://e.edu.kz/ru/statistics.html>, open data portal of the Russian Federation (<https://data.gov.ru/o-proekte>), open data portal of the Ministry of Education and Science of Russia (<http://открытые-данные.минобрнауки.рф/опендата/>), and other digital services for statistics and data analytics in education.

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