Big Data in Education

Kazakova Olga Alexandrovna[1][a], Ivanova Lidiya Alexandrovna[1][b], Kurilenko Lyudmila Vasilyevna[2][c], Seleznev Anton Albertovich[2][d]
[1]*Samara State University of Economics, Samara, Russia,*
[2]*Samara National Research University named after S.P. Korolev, Samara, Russia,*
kfv2012@mail.ru , kazakova.kpn@gmail.com, kurilenko.lv@ssau.ru, kia1971@yandex.ru

Keywords: BigData, analytics system, data algorithms, visualization method, statistical data, educational process in physical culture and sports.

Abstract: With the development of computer technology and artificial intelligence, there is a steady increase in information on various operating systems. As a result, new technologies for processing this data and their analysis procedures are constantly emerging, which create additional opportunities for analyzing the economy, education, production and much more. Today, the digital transformation of education is analyzed using big data. It was BigData analytics that made it possible to systematize a huge amount of accumulated information, build educational trajectories in a new way and create smart educational programs, as well as apply modern data algorithms in electronic educational resources and special programs, which will directly help adapt the educational process to the characteristics of each student and predict the results of his training. The authors used the BigData analytics system to study and analyze the effectiveness of increasing students' independent motor activity. We conducted an experiment on the use of BigData analysis and concluded that using "big data" it is possible to look at the dynamics of increasing students' motor activity. And the case of interpreting the results obtained by key indicators shows that the method of visualizing statistical data has a great future in universities, can help in the development of program material and planning the educational process.

1 INTRODUCTION

Each epoch is characterized by its own reorganizations. Nowadays, special attention is paid to the digital economy, which is developing rapidly. Modern digital technologies are increasingly entering our lives, where the "big data" analyte has become a real breakthrough for analysis and forecasting (Aleksina, Chernova and Aleksin, 2020).

However, the idea of using "big data" appeared back in the 1960s and 1970s, but it began to be developed most effectively in the last few years, which was facilitated by the economic and political development of our society [Electronic resource]2.

Domestic and foreign researchers are engaged in the study of the digital economy, including N. Negroponte, E. N. Veduta, L. P. Goncharenko, S. Y. Glazyev, A. I. Gretchenko, V. V. Ivanov, M. Yol, G. Kaijun, M. V. Kudina, V. I. Mayevsky, G. G. Malinetsky, D. Tapscott, A. Espinosa and others (Grishko, Pyatkova, Stepanova, 2020).

With the development of computer technology and artificial intelligence, there is a constant increase in information on various operating systems, digitization of data, their processing and accounting. As a result, there is an increasing need to analyze and use this data in many directions: to assess the state of the market and goods, analyze consumer behavior, predict public demand and a deep understanding of customer needs, in the financial sector - to collect information on the creditworthiness of the population, assess financial risks and investment portfolios. BigData provides an opportunity to explore target audiences, create personalized advertising campaigns and increase the effectiveness of marketing budgets.

[a] https://orcid.org/009-0008-3230-8372
[b] https://orcid.org/0009-0003-4416-818X
[c] https://orcid.org/0000-0001-8602-0659
[d] https://orcid.org/0009-0009-1951-5227

However, with the development of digital technologies, the problem of information security, (Chang, McAleer, Wong, 2018).

It should be emphasized that today we are already witnessing how BigData has changed its approach to marketing, financial transactions, management and many other areas of activity (Shamsutdinova, Prokofieva, 2023). One of these areas has become the education system.

At the moment, education is the main tool of strategic management for the long-term socio-economic development of our country, modernizing which it is necessary to take into account the processing of a large amount of data. It was BigData analytics that made it possible to analyze and systematize a huge amount of accumulated information, build educational trajectories in a new way and create smart educational programs, as well as apply modern data algorithms in electronic educational resources and special programs, which directly helped to adapt the educational process to the characteristics of each student and predict the results of his studies.

Today, the principle of financing universities from the state has been changed in higher education, which directly affects their economic efficiency and contributes to a quick response to any external and internal changes. The transition from estimated to normative per capita financing of public services in the field of education forces universities to develop new education technologies that are aimed at improving its quality. But, at the moment, this topic has not been sufficiently disclosed in the pedagogical literature. V.I. Zvonnikov and M. B. Chelyshkova are engaged in research in this area. M. Shamsutdinova,S. V. Prokofieva, Vaganova O. I., Gladkov A.V., Konovalova E. Yu., Voronina I. R. Vaganova O. I. (Gladkov, Konovalova, Voronina, 2020). E. V. Kupchishina, O. A. Fiofanova (Fiofanova, 2020) and others.

After leaving the Bologna education system, where there was a single standard of education and a desire to unify educational systems, the Russian Federation is creating its own education system based on its own ideas about the values and priorities of educational activities. There is a digital transformation of education, where, according to Gvozdenko Yu.V., Ishchenko A.A., Pilipenko A.V., "BigData" should be used for an objective assessment of the quality of education.

The purpose of the work: to study the influence of BigData on the objective assessment of students' motor activity using modern fitness trackers.

To solve the purpose of the work, the following tasks were set: to study the scientific and methodological literature on this topic; to analyze the data on the assessment of motor activity using fitness trackers in students; to draw conclusions.

2 MATERIALS AND METHODS

Research materials and methods: The following methods were used in our study: analysis of literary sources and pedagogical experience in the aspect of the problem under study, methods of mathematical statistics, computer technology BigData, adapted at the university by specialists of the information environment.

3 RESULTS AND DISCUSSION

We agree with the opinion of scientists who claim, that BigData will help model the future in education by providing unprecedented opportunities to improve the quality of learning, personalize the educational process and improve student outcomes. Even any lagging student will find his own individual educational trajectory in such an education system.
The authors propose to create a "computational pedagogy" (Gvozdenko, Ishchenko, Pilipenko, 2020), which is based on the processing of big data. It should be based on an objective analysis of various events translated into numbers and will allow us to calculate patterns that arise in the learning process in different regions of our country. This approach in pedagogy will make learning more effective, i.e. analyzing and processing the experience of thousands of teachers and students, it is possible to develop a modern teaching methodology, taking only the best from leading teachers.

According to Gvozdenko Yu.V., Ishchenko A.A., Pilipenko A.V. big data can be used in three directions. The first is the construction of individual training programs, the second is the creation of a "smart program" that makes changes through data analysis as a result of interaction with online content of students, and thirdly, changing approaches to monitoring and evaluating both the educational process itself and educational results (Gvozdenko, Ishchenko, Pilipenko, 2020).

We see that with the help of modern programs today, students can independently build an individual course program or complete an additional task to improve their performance (Abdykarimova, 2019).

There are already programs that can analyze how successfully the course will be completed even before the start of training, with the help of big data, the teacher can identify lagging students and pay attention to them, give the necessary additional material (Hieu, Huy, Phat, Phuong Anh, 2020). After graduation, the system itself will create a digital portfolio for each student, which will be useful for their future careers (Rumyantseva, 2022).

Another area of application of BigData is the sports industry. Sports industry analytics are based on big data processing. The sports data analytics market is projected to reach $4.5 billion by 2025.

Given the current level of development of computer algorithms, it is natural to assume that a huge help in sports analytics The industry is supported by artificial intelligence. Various companies are helping to train high-level athletes today, for example, ICEBERG participates in the training process of the Russian Olympic hockey team. With the help of predictive analytics, individual training programs are built for them, the effectiveness of the training process and methods of improving sports skills are analyzed.

One of the pioneers of the scientific data-oriented approach to the training process was the Soviet Union, where leading trainers carried out complex analytical work using computers back in the late 70s (Grishko, Pyatkova, Stepanova, 2020).

As is well known, a coach, collecting data about an athlete for a certain amount of time, can predict the success of training and prevent his injuries, as well as give additional recommendations on the training process. With the help of sports analytics, players are evaluated. This is very important for hiring them to sports teams. When compiling a player's rating, almost everything is taken into account: the general HYPE, brand, level of play, consistency, etc. Of course, Big Data technologies and modern gadgets help in all this.

Today, in most universities of the Russian Federation, the physical culture and sports program provides one lesson per week for four, and in some universities for five semesters. The second lesson was taken out for independent study. Obviously, such personalization of classes should take into account the need, desire, involvement in the learning aspect and the presence of a temporary aspect of our students to engage outside the framework of a higher educational institution.

At the same time, the question of whether such classes bring effectiveness in the development of motor activity and whether they are performed by students remains debatable.

We offer the experience of the teaching team of Samara State University of Economics (SSEU) based on the results of determining the level of motor activity of students, in order to predict decisions in improving the quality of education in the subject of physical culture and sports.

The essence of the method proposed for consideration is that a team of teachers from any university receive management tools that can regulate the delta of the development of students' motor activity during a certain period of study within the subject of physical culture and sports, during their independent preparation.

The education system has always traditionally analyzed data on the academic performance of students, but information about the physical activity of students has almost never been analyzed.

The emergence of BigData has led to an expansion of the possibilities of automatic processing of comprehensive information (Mahendra Pratama, Rachmadiansyah, Sidharta 2023)], characterizing, among other things, the physical activity of students. Therefore, to implement this topic, we used fitness trackers to collect data on the physical activity of students who expressed a desire to participate in this study (300 people).

The following indicators were recorded on the gadget: date, time spent in active mode; distance traveled; number of steps; heart rate and sleep. The data were grouped by days, weeks, and months (Dtmier, Gupta, Wong, 2019).

Then, using the methods of mathematical statistics, the obtained materials were analyzed. Of which, we found a significant correlation between the time spent in active motor mode and the number of steps, as well as between the level of activity and purity of heart rate, which is logically explained by the training process.

In the experiment we conducted, we confirmed the assumption that many students only say that they go to play sports, but in fact have a low level of motor activity and not a regular training schedule. Next, to study the desire and availability of time for sports, we suggested filling out a questionnaire consisting of 10 questions. After analyzing the responses of the students, we found out their emotional background, which is important for identifying the motivation of students (Yohanes, Surya Putra, Filbert, Margi Suryaningrum, Amalia Saputri, 2023).

We have formed the updating of the data obtained according to the following strategic guidelines: indicators of passing control standards for the subject of physical culture and sports; independent activity; regularity of independent studies; desire to play sports, growth of physical indicators.

From the analysis of the received BigData, a diagram was formed (Figure 1), as optimally accommodating any number of strategic landmarks and maximally visualizing the priorities of the development of students' motor activity, depending on the big data that the operator receives to fill in. It was shown and explained to the students, and based on it, a table of disadvantages of independent work of students was formed.

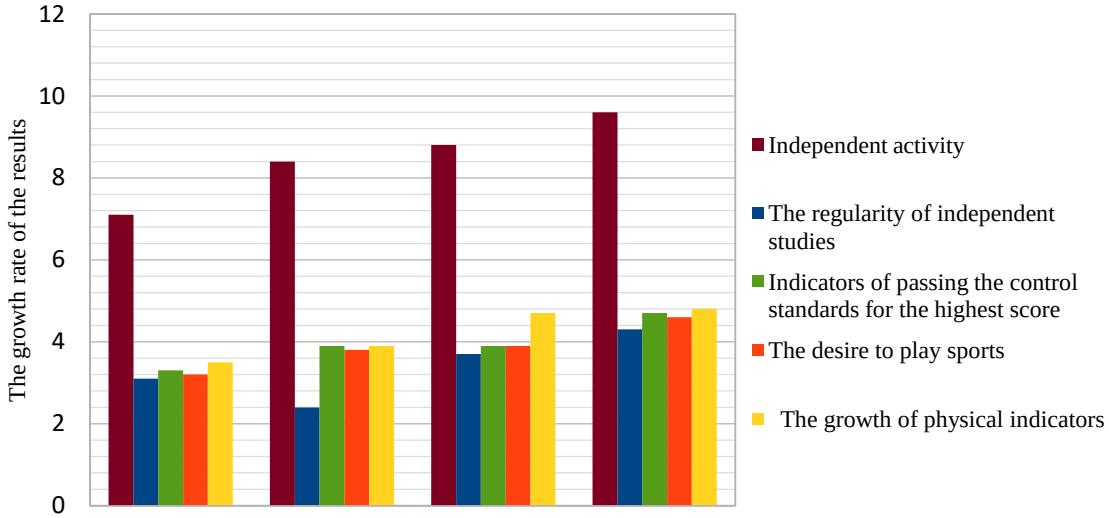

Figure 1: Visualization of statistical data of students on the identification of independent motor activity for one semester in 2023.

Using this method of visualization of statistical data, we were able not only to identify positive dynamics in the development of independent motor activity of students, but also their shortcomings in the regularity of independent studies, the desire to play sports.

Fig. Visualization of statistical data of students on the identification of independent motor activity for one semester in 2023.

Thus, according to the authors, the analysis of big data should contribute to the rapid adjustment of students' independent work, a truthful attitude to independent studies (about 36% of unreliable indicators indicated by students during the survey were revealed), which will necessarily lead to an improvement in the learning process in the discipline of physical culture and sports in universities.

Analyzing the graph, the following conclusions can be drawn:

- the low level of passing control standards (+ 1.5%) can be explained by the lack of a second lesson in the discipline in the training system;

- independent activity shows reliability ($p>0.5$) only for those students who are engaged in sports sections and understand the need for their physical development;

- the regularity of independent studies is not homogeneous, which indicates an insufficient level of students' knowledge about conducting independent studies;

- the growth of physical indicators directly depends on the mode of physical activity of students;

- a low level of desire to exercise regularly on their own indicates a lack of free time and a heavy workload of the educational process.

Thus, using "BigData" we can look at the dynamics of increasing students' motor activity.

A case study of the interpretation of the results obtained on key indicators of the effectiveness of the implementation of educational programs in the discipline of physical culture and sports on the example of these indicators of students of SSEU for one semester in 2023 shows that the method of visualization of statistical data has a great future in universities, can help in the development of program material and planning the educational process.

4 CONCLUSIONS

BigData has a large amount of comprehensive information, which can be significantly used in the

analysis and selection of physical education tools in classes with students at the university. Using them, it is possible to optimize the learning process and make it more attractive to our students.

We hope that in the future it will be possible to use BigData to generate information to the university admissions committee about the sports component of applicants and predict the admission of athletes to the university, but this system must first work at school.

REFERENCES

Aleksina, A.O., Chernova, D.V., Aleksin, A.Y., 2020. Electronic interaction in the sphere of physical culture and sports services in Russia. *Advances in Intelligent Systems and Computing. Vol. 908, 703-713*.

Big Data: what is it, how to search, store and use [Electronic resource]. URL: https://selectel.ru/blog/big-data-basics / (date of access: 04/16/2022)

Grishko, N.V., Pyatkova, N.P., Stepanova, Yu.L., 2020. Stages of development of the digital economy. *Economic Vestnik of the State Educational Institution of the LPR "DonGTU", 4, 39-45.*

Chang, C.-L., McAleer, M., Wong, W.-K., 2018. Big Data, Computational Science, Economics, Finance, Marketing, Management, and Psychology. *Connections. SSRN Electronic Journal. .10, 2139.*

Shamsutdinova, T. M., Prokofieva S. V., 2023. Assessment of the practice orientation of professional educational programs in the training of IT specialists. *Vocational Education and Labour Market. Vol.11, 1, 89-105.*

Vaganova, O. I., Gladkov, A.V., Konovalova, E. Yu., Voronina, I. R., 2020. Digital technologies in the educational space. *Baltic Humanitarian Journal, Vol. 9, 2 (31), 53-56.*

Fiofanova, O. A., 2020. Methods of analysis of educational data and ways of their application in pedagogical and managerial practice in the field of education. *School technologies, 1, 117-127.*

Gvozdenko, Yu.V., Ishchenko, A.A., Pilipenko, A.V., 2020. Theory of generalization: designs in the evalution of education and general provisions. *Vestnik nauki, 4 (25). Vol.3, 31-38.*

Hieu, N. T. Huy, L.M., Phat, H.M., Phuong Anh, N.N., 2020. The_STEMtech_Model_to_Create_Stem_Products_at_High_Schools_in_Vietnam, *Advances in Decision Sciences, 24(2) 1-50.*

Rumyantseva, K.V., 2022. Big data: some issues and technologies. *Vestnik nauki, 5 (50). Vol. 3, 146 – 150.*

Abdykarimova, A. T., 2019. Big Data: problems and technologies. *Computer and information technologies., 5, 55-57.*

Kovalchuk, S. V., Zakharchuk, A. V., Liao, J., Ivanov, S. V., Boukhanovsky, A.V., 2014. A Technology for BigData Analysis Task Description using Domain-Specific Languages. Procedia Computer Science, ICCS 2014. *14th International Conference on Computational Science. Vol. 29, 488–498.*

Mahendra Pratama, R.A., Rachmadiansyah, K.I., Sidharta, S., 2023. Technique of Mental Health Issues Classification based on Machine Learning: Systematic Literature Review. *Empowering Smart Technology in Digital Era for Industry and Socity: The 8th International Conference on Computer Science and Computational Intelligence, 02-03 August 2023, Malang, Indonesia. Procedia Computer Science 227, Elsevier2023,137-146*

Dtmier, R., Gupta, P., Wong, W-K., 2019. Evidence from Multivariate Linear and Nonlinear Causality Tests. Sustainable development, 1(2), 351.

Yohanes, D., Surya Putra, J., Filbert, K., Margi, Suryaningrum, K., Amalia Saputri, H., 2023. Emotion Detection in Textual Data using Deep Learning. *Empowering Smart Technology in Digital Era for Industry and Socity: The 8th International Conference on Computer Science and Computational Intelligence, 02-03 August 2023, Malang, Indonesia. Procedia Computer Science 227, Elsevier2023, 464-473.*