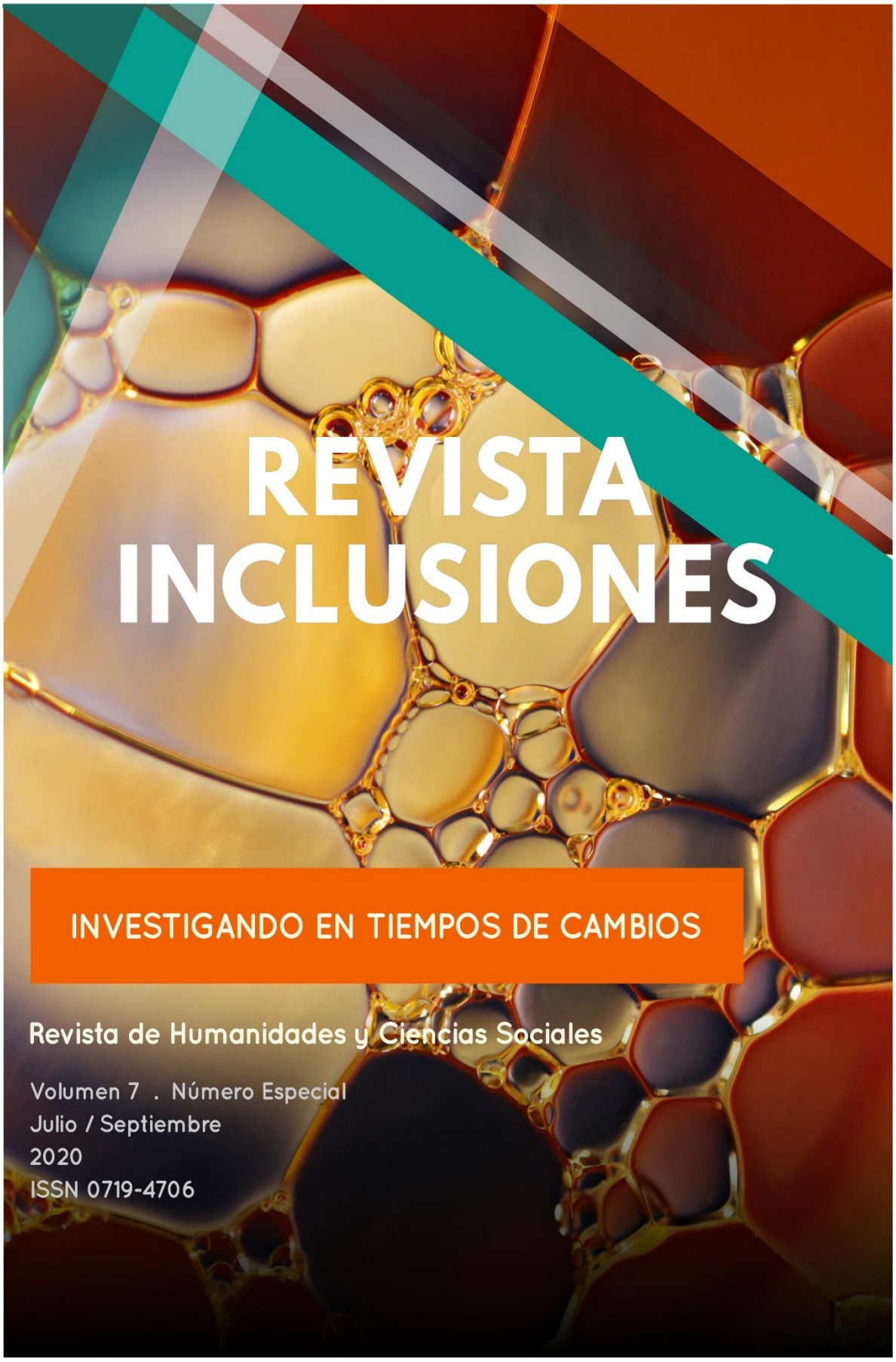

REVISTA INCLUSIONES

INVESTIGANDO EN TIEMPOS DE CAMBIOS

Revista de Humanidades y Ciencias Sociales

Volumen 7 . Número Especial
Julio / Septiembre
2020
ISSN 0719-4706

REVISTA
INCLUSIONES
REVISTA DE HUMANIDADES
Y CIENCIAS SOCIALES

CUADERNOS DE SOFÍA
EDITORIAL

REVISTA INCLUSIONES
REVISTA DE HUMANIDADES Y CIENCIAS SOCIALES

CUADERNOS DE SOFÍA EDITORIAL

Editorial Cuadernos de Sofía
Santiago – Chile
Representante Legal
Juan Guillermo Estay Sepúlveda Editorial

REVISTA INCLUSIONES
REVISTA DE HUMANIDADES Y CIENCIAS SOCIALES

Indización, Repositorios y Bases de Datos Académicas

Revista Inclusiones, se encuentra indizada en:

BIBLIOTECA UNIVERSIDAD DE CONCEPCIÓN

REVISTA INCLUSIONES
REVISTA DE HUMANIDADES Y CIENCIAS SOCIALES

CUADERNOS DE SOFÍA EDITORIAL

ISSN 0719-4706 - Volumen 7 / Número Especial / Julio – Septiembre 2020 pp.01-08

APPLICATION OF EDUCATIONAL DATA ANALYSIS METHODS IN THE EVALUATION OF LESSON SCENARIOS IN THE MOSCOW ELECTRONIC SCHOOL

Ph. D. Kirill A. Barannikov
Moscow City University, Russia
ORCID: 0000-0001-5182-9458
barannikovka@mgpu.ru
Ph. D. Sergey M. Lesin
Moscow City University, Russia
ORCID: 0000-0003-0478-4343
lesinsm@mgpu.ru
Dr. Svetlana N. Vachkova
Moscow City University, Russia
ORCID: 0000-0002-3136-3336
svachkova@mgpu.ru
Lic. Ruslan S. Suleymanov
Moscow City University, Russia
ORCID: 0000-0002-7772-597X
sulejmanovRS@mgpu.ru
Lic. Roman B. Kupriyanov
Moscow City University, Russia
ORCID: 0000-0001-5153-4334
kupriyanovRB@mgpu.ru

Fecha de Recepción: 20 de febrero de 2020 – **Fecha Revisión**: 14 de marzo de 2020

Fecha de Aceptación: 29 de mayo de 2020 – **Fecha de Publicación**: 01 de julio de 2020

Abstract

The article discusses the implementation of educational data mining methodology, including traditional Data Mining methods (classification, clustering, rating analysis, etc.), to identify patterns in the assessment of lesson scenarios in the Moscow Electronic School by experts. The authors describe the educational data mining methodology as an approach to designing organizational and managerial decisions.

Keywords

Educational Data Mining – Moscow Electronic School – Integration educational data – Data Mining

Para Citar este Artículo:

Barannikov, Kirill A.; Lesin, Sergey M.; Vachkova, Svetlana N.; Suleymanov, Ruslan S. y Kupriyanov, Roman B. Application of educational data analysis methods in the evaluation of lesson scenarios in the Moscow Electronic School. Revista Inclusiones Vol: 7 num Especial (2020): 01-08.

Introduction

The modern education management system assumes efficient interaction of all participants of the educational activities. In the conditions of digital economy, the education management system is also undergoing changes in the use of methods for data intellectual analysis, specifically direct application of the results of analyzing the educational data.

Educational data analysis is a field of research related to application of intellectual data analysis methods (Data mining), machine learning, and statistics to the information produced by educational establishments[1].

The methods used in the educational data analysis include the following options[2]. Cluster analysis, for example, to determine different quality levels of formation and effectiveness of pupils' academic results and to predict them. Regressive model method, which is used to determine correlations between various factors related to the organization and implementation of educational activities in a specific educational establishment. Discriminant model method, required for compiling various samples and arrays of educational data in order to study success rates of pupils and classify them according to the identified trends or parameters.

There is another angle from which to consider technology in education. Data can support the redesign of education, as it has already done in so many other sectors. Imagine the power of an education system that could share its collective expertise and experience through new digital spaces. But throwing education data into the public space does not, in itself, change how students learn, how teachers teach or how schools operate. That is the discouraging lesson from many administrative accountability systems. Turning digital exhaust into digital fuel, and using data as a catalyst to change education practice, requires getting out of the “read-only” mode of our education systems, in which information is presented as if inscribed in stone. This involves combining data with collaboration[3].

For the Moscow region, the educational data analysis is relevant when using electronic educational systems of education management. Such electronic system in Moscow is called the Moscow Electronic School (https://uchebnik.mos.ru/), which has been integrated (http://mes.mosedu.ru/) as a single platform into all educational establishments of general education together with an electronic diary since September 2017.

Moscow Electronic School is a project for teachers, children, and parents aimed at creating high-tech educational environment in Moscow schools. MES has a software part - an electronic journal, an electronic diary, and a library of electronic materials. "MES Library". (https://uchebnik.mos.ru/catalogue) is a platform on which educational materials are digitally stored[4].

---

[1] P. P. Belonozhko, A. P. Karpenko, D. A. Khramov, “Analysis of educational data: fields and prospects of application”, Online journal “Science” Vol: 9 num 4 (2017).

[2] R. Baker y K. Yacef, “The state of educational data mining in 2009: A review and future visions”, Journal of Educational Data Mining Vol: 1 num 1 (2009): 3-17.

[3] A. Schleicher, Building a learning culture for the digital world: lessons from Moscow. OECD Education and Skills Today. 2019. Retrieved from: https://oecdedutoday.com/learning-digital-world-technology-education-moscow/

[4] S. N. Vachkova; V. K. Obydenkova; A. A. Zaslavskiy y S. V. Kats, “About the reasons of a demand for the lesson scenarios of the "Moscow electronic school", Bulletin of the Moscow city pedagogical university. Series: Pedagogy and psychology Vol: 1 num 51 (2020): 8-24 y O. Yu. Zaslavskaya; A. A.

The Moscow Electronic School is a cloud-based Internet platform that includes the following key components: required educational materials for educational activities in all subjects; tools for their creation and editing, mainly for teachers (starting from 2019 - for all interested people); constructor of the digital basic educational program tasks[5].

The most promising aspect in the development of MES functionality is provision, in some cases, of shared access to devices of pupils and shared viewing of the results obtained by them, the possibility of customizing the approach to provision of information for each pupil in the classroom, the expansion of a tool set for individual and collective communication between pupils for implementation of joint projects aimed at solving educational problems[6].

Methods

The study was based on the analysis of popular lesson scenarios chosen by experts and posted at MES. It was also necessary to analyze the distribution of expert ratings depending on the number of scenarios placed by the author. Popularity or maximum number of expert ratings allows the scenario author to gain the advantage over others. Popularity means the maximum number of choices and starts of scenario lessons, which brings its author an advantage over the competitors. This makes it possible to get a money reward for the scenario that becomes the most popular. Therefore, different data were considered, including the total number of scenarios of the author directly placed at MES; the number of clicks and positive ratings (likes) of the scenarios.

To obtain the study results at preliminary stage, the educational data analysis method - clustering (grouping) of expert ratings and identification of groups of scenario authors at MES - was used.

The method of distributing the authors by the number of created and placed scenarios was used to predict the general trend and the rate of emergence of future scenarios at MES.

Further, it was necessary to analyze the correlation between the lesson scenario indicators and the expert ratings, as well as preconception of their ratings based on linear regression, whereby the expert rating was the predictive variable. The linear regression method, as a part of the educational data analysis methodology, allows determining the properties of expert ratings taking into account probability characteristics of factors or random errors. Thus, it allows to determine the degree of preconception of the experts who have evaluated the scenarios with mathematical exactness.

In general, the methodology applied in the research is aimed at using the educational data analysis for drawing up forecasts and determining reliable results of the expert ratings.

Zaslavskiy y V. E. Bolnokin, “Information technologies in the study of the implementing complex logic functions possibilities”, Journal of Physics: Conference Series Vol: 1399 num 3 (2019).

[5] V. V. Grishkun y I. M. Remorenko, “Frontiers of the "Moscow electronic school", Informatics and education num 7 (2017): 3-8 y O. Yu. Zaslavskaya; A. A. Zaslavskiy; V. E. Bolnokin y O. Ja. Kravets, “Features of Ensuring Information Security when Using Cloud Technologies in Educational Institutions”, International Journal on Information Technologies and Security Vol: 10 num 3 (2018): 93-102.

[6] V. V. Grishkun y I. M. Remorenko, Frontiers of the "Moscow electronic school", Informatics and education num 7 (2017): 3-8.

Having seen the forecast, it is more likely to make managerial and organizational and pedagogical decisions in terms of the strategy of creating lesson scenarios at MES, analyzing their popularity and probability of their selection by experts for further use in the educational activities of the educational establishment.

Results and Discussion

At the time of the study (2018-2019), the following sample was chosen.

- Number of lesson scenarios with expert ratings - 1,902
- Total number of views - 378,915.
- Number of authors - 341

Using the clustering and generalization method, the result shown in Figure 1 was obtained.

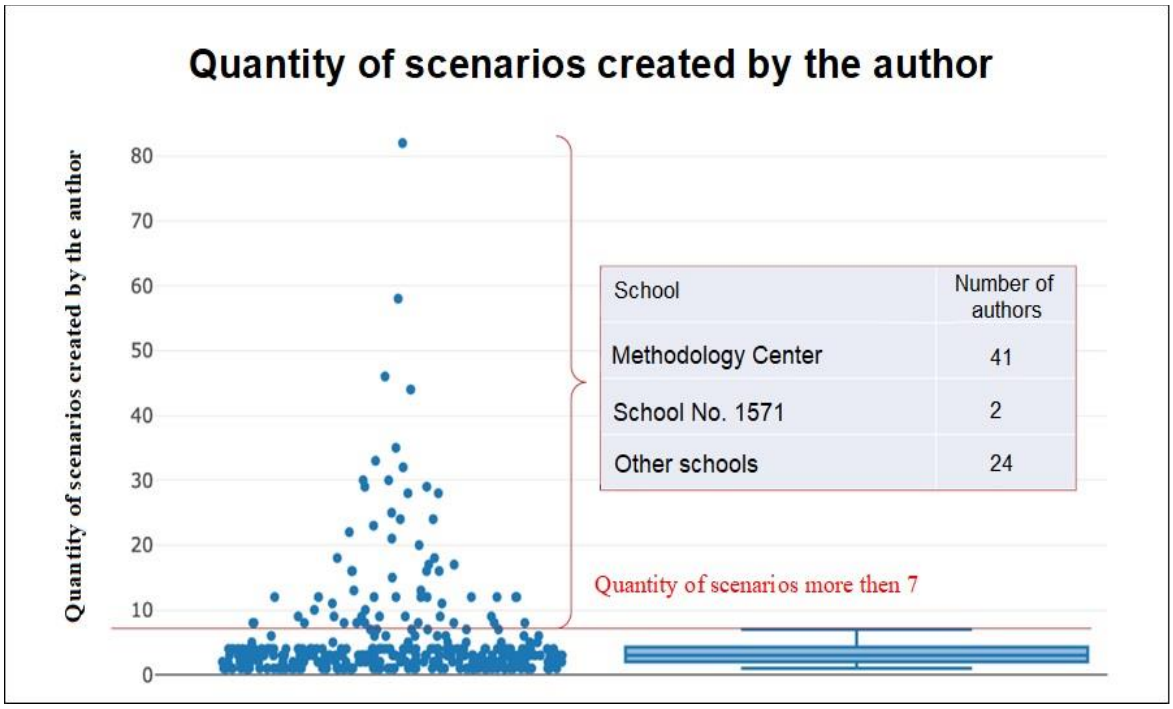

Figure 1
Distribution of authors by the number of lesson scenarios they created

Figure 1 shows the distribution of authors by the number of lesson scenarios they created and a box plot of this distribution (on the right). As you can see from the box plot, the number of lesson scenarios created by one author ranges from 1 to 7 lessons. The analysis showed that most of the authors create not more than 3-4 lesson scenarios.

Let's compare the expert ratings of the authors' scenario lessons, who create from 1 to 7 lesson scenarios and more than 7. The results of the analysis are presented in Figure 2.

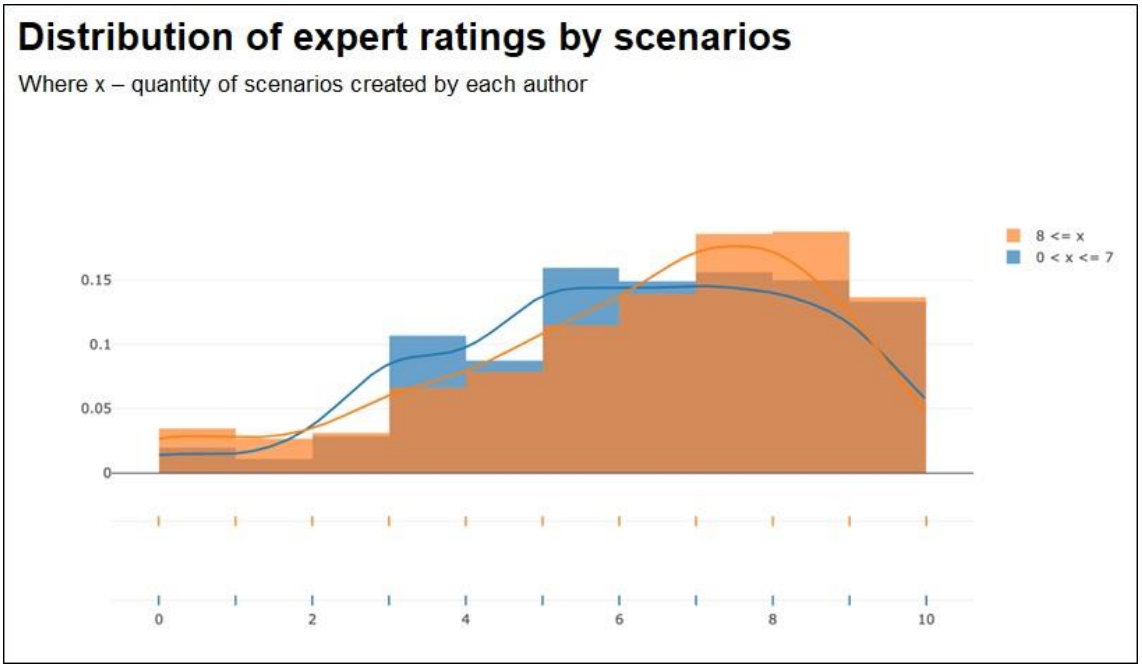

Figure 2
Distribution of expert ratings by scenarios

By analyzing the lesson scenario rating data in Figure 2 you can see the distribution of expert scores for the authors who create 1 to 7 lessons and authors who create more than 7 lessons. The distribution of expert ratings by lesson scenario for these two groups is presented. It was found that the authors who create between 1 and 7 scenarios are more likely to have 50 or more views and get ratings from 5 to 9 from the experts, while the authors who create more than 7 scenarios are more likely to have more than 150 or more views and get the rating exceeding 8. The dependency of the number of scenario views by teachers on how the experts rate the scenarios requires a specific detailed research to identify or disprove a consistent pattern in the future.

Another correlation that has been established in the educational data analysis of correlation between the lesson scenario indicators and the expert ratings. On the basis of linear regression, where predictive variable was the expert rating, the most significant indicators for the experts included:

– Number of copies - significance level 30%;

– Ratio of likes to views - significance level 13%.

The least significant indicator for the experts was the lesson scenario rating: significance level 1%.

In order to check the reliability of expert ratings, the degree of their preconception was analyzed and the degree of their uniformity was determined. For this purpose, an algorithm has been developed and programmed to identify the experts whose ratings of one or more scenarios differ by more than 30% from the ratings given by this expert to other lesson scenarios, and the average rating of the presented scenario differs by 30% from the expert's rating.

As a result of this analysis, eight experts were identified whose ratings for a total of 12 lesson scenarios were considered preconceived by the algorithm. The example of these lesson scenarios is shown in figures 3 and 4.

Expert X1
Scenarios name: Basketball (lesson 3)
Subject: Sports
Expert rating: 10
Average scenario rating: 6.25

Figure 3
Example of overrating by an expert

Expert X2
Scenarios name: Culture of Ancient Rus'
Subject: The world around us (elementary school)
Expert rating: 2
Average scenario rating: 5.5

Figure 4
Example of underrating by an expert

In addition, the uniformity of ratings given by the expert was analyzed. It is considered that if the standard deviation of the ratings given by the expert is less than 1, the expert will give similar ratings. In total, four experts who have given similar ratings have been identified. The ratings of these experts are presented in Tables 1-4.

Rating	Number of scenarios
5	33
6	4
8	1
7	1
4	1

Table 1
X1 expert ratings

Standard deviation of X1 expert ratings makes 0.65. The rating "5" was given by the expert in 83% of cases.

Rating	Number of scenarios
4	**28**
3	**6**
5	**3**
2	**2**
7	**1**
6	**1**

Table 2
X2 expert ratings

Standard deviation of X2 expert ratings makes 0.86. The rating “4” was given by the expert in 68% of cases, the rating “3” - in 15% of cases. In total, ratings “3” and “4” were given in 83% of cases.

Rating	Number of scenarios
7	15
8	8
6	8
5	3
9	1

Table 3
X3 expert ratings

Standard deviation of X3 expert ratings makes 0.96. The rating “7” was given by the expert in 43% of cases, the rating “8” - in 23% of cases, and the rating “6” - also in 23% of cases. In total, the ratings “6”, “7” and “8” were given in 89% of cases.

Rating	Number of scenarios
7	4
8	3
6	2
5	1

Table 4
X4 expert ratings

Standard deviation of X4 expert ratings makes 0.99. The ratings were put on a 4-point scale.

Conclusion

The analysis has shown a certain degree of prejudice among the experts, but it can be easily identified, and such an expert can be removed from the rating procedure in the future. The developed algorithm allows to independently evaluate the work of each expert and can be used to select the experts for further work. Thus, the methods and algorithms of the educational data analysis can be applied in practice to increase the level of reliability of the lesson scenario rating at MES.

Acknowledgments

The article is published under the RFBR grant as the realization of the research project no. 19-29-14016-MK "Methodology of big data mining in education and its integration into the professional teachers' training and managers of general education organizations programs in the logic of "Data-Based Pedagogy", "Data-Based Education Management" (agreement no. 19-29-14016\19 of 18.11.2019).

References

Baker, R. y Yacef, K. "The state of educational data mining in 2009: A review and future visions". Journal of Educational Data Mining Vol: 1 num 1 (2009): 3-17.

Belonozhko, P. P.; Karpenko, A. P. y Khramov, D. A. "Analysis of educational data: fields and prospects of application". Online journal "Science" Vol: 9 num 4 (2017).

Grishkun, V. V. y Remorenko, I. M. "Frontiers of the "Moscow electronic school". Informatics and education num 7 (2017): 3-8.

Schleicher, A. Building a learning culture for the digital world: lessons from Moscow. OECD Education and Skills Today. 2019. Retrieved from: https://oecdedutoday.com/learning-digital-world-technology-education-moscow/

Vachkova, S. N.; Obydenkova, V. K.; Zaslavskiy, A. A. y Kats, S. V. "About the reasons of a demand for the lesson scenarios of the "Moscow electronic school". Bulletin of the Moscow city pedagogical university. Series: Pedagogy and psychology Vol: 1 num 51 (2020): 8-24.

Zaslavskaya, O. Yu.; Zaslavskiy, A. A. y Bolnokin, V. E. "Information technologies in the study of the implementing complex logic functions possibilities". Journal of Physics: Conference Series Vol: 1399 num 3 (2019).

Zaslavskaya, O. Yu.; Zaslavskiy, A. A.; Bolnokin, V. E. y Kravets, O. Ja. "Features of Ensuring Information Security when Using Cloud Technologies in Educational Institutions". International Journal on Information Technologies and Security Vol: 10 num 3 (2018): 93-102.

CUADERNOS DE SOFÍA
EDITORIAL