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DYNAMICS IN ACADEMIC PERFORMANCE DURING THE TRANSITION TO DISTANCE LEARNING

DINÁMICA DEL RENDIMIENTO ACADÉMICO DURANTE LA TRANSICIÓN A LA EDUCACIÓN A DISTANCIA

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ABSTRACT

To comprehensively assess the effectiveness of education, it is necessary to consider the dynamics of expulsions. During the forced transition to online learning, it is important to monitor the main reasons for dropout and the quantitative indicators of such expulsions since it allows the university administration to comprehend the situation and promptly take corrective measures. The article provides a comparative analysis of expulsions of full-time students pursuing degrees in "Computer Science and Computer Engineering" and "Information Security" at the Moscow Polytechnic University in the period from 2018 to 2021. The analysis of expulsions has demonstrated that the dropout rate of students was approximately the same before the introduction of quarantine measures, during the transition to distance learning and studying in a mixed format. During the quarantine and after it, the number of students expelled at their own request also increased.

Keywords:

Dynamics in academic performance, online education, remote learning, information security.

RESUMEN

Para evaluar integralmente la eficacia de la educación, es necesario considerar la dinámica de las expulsiones. Durante la transición forzada a la educación en línea, es importante monitorear las principales causas de deserción y los indicadores cuantitativos de dichas expulsiones, ya que permite a la administración universitaria comprender la situación y tomar medidas correctivas oportunamente. El artículo proporciona un análisis comparativo de las expulsiones de estudiantes de tiempo completo de las carreras de "Ciencias de la Computación e Ingeniería Informática" y "Seguridad de la Información" en la Universidad Politécnica de Moscú en el período de 2018 a 2021. El análisis de las expulsiones ha demostrado que la deserción la tasa de estudiantes era aproximadamente la misma antes de la introducción de las medidas de cuarentena, durante la transición al aprendizaje a distancia y al estudio en un formato mixto. Durante la cuarentena y después de ella, también aumentó el número de estudiantes expulsados a petición propia.

Palabras clave:

Dinámicas en el rendimiento académico, educación en línea, aprendizaje remoto, seguridad de la información

INTRODUCTION

Due to the risk of the coronavirus spread, most universities and colleges decided to switch to distance learning following the recommendation of the Ministry of Science and Higher Education of the Russian Federation. During the spring semester of the 2019-2020 academic year, students were taught online due to the unfavorable epidemiological situation. In the fall of the 2020-2021 academic year, the learning process at the university was held in a mixed mode. Despite the announcement of the accelerated introduction of digital technologies in the economy and social sphere in 2018 (President of the Russian Federation, 2018), most educational organizations were not ready for the full implementation of e-learning (Bugrov & Krepets, 2020; Zueva & Vinogradova 2021). The study results show that not all disciplines were extended with online courses, most teachers did not have experience in using massive open online courses (MOOCs), and students did not have the necessary skills to successfully complete such online courses (Bekova et al., 2020; Chirikov et al., 2020; Klyagin et al., 2020; Larionova et al., 2020).

The advantages and disadvantages of the forced transition to distance learning are considered in the article (Mamchik et al., 2021). The most common challenges are as follows: the complexity of organizing the educational process and motivating students to work independently; communication with teachers; the temptation of non-independent learning. However, modern education can no longer ignore online learning. For this reason, it is vital to assess the educational results of online learning. In this regard, the question arises: how to evaluate the quality of online education? One of the possible tools for this purpose can be the assessment of the dynamics of the process. We propose to measure the progress of students on the basis of their final grades in the studied disciplines, using integral indicators, such as the average student score in all the disciplines studied and the average student score in the whole curriculum (Shukhman et al., 2021). As a result, the research has shown that the average score of students at the end of the session did not undergo significant changes due to a new format of education (Bekova et al., 2020; Shukhman et al., 2021). It has been revealed that academic performance was at a higher level in the course of distance learning, i.e. students got higher marks when assessing their knowledge (Lomovtseva, 2009; Chernykh et al., 2020; Mamchik et al., 2020). This might be connected with the form of knowledge control in the context of the availability of educational literature and the Internet (Chernykh et al., 2020). At the same time, distance learning allows students to successfully master only the theoretical part of a discipline (Pyatibrat et al., 2021).

The results of experimental studies prove that online and mixed courses ensure the same level of educational results as traditional disciplines taught at the university (Bekova et al., 2020). However, the fact that students prefer a traditional or mixed format, as well as a large number of students who have not completed courses, highlights the need to take into account the number of expulsions when assessing the effectiveness of training in general (Shcheglova et al., 2020; Shmeleva & Frumin, 2020).

At the same time, there is no understanding of the quality of education in the transition to distance learning. In addition, the effectiveness of the online format as a whole is unproven.

The research aims at studying the dynamics of expulsions of students pursuing degrees in "Computer Science and Computer Engineering" and "Information Security" from the Faculty of Information Technology depending on the format of education, as well as to determine the relationship between the number of expulsions and the student's place of residence.

The study answers the following questions: how do the dynamics of students' expulsions from the Faculty of Information Technology change depending on the format of education?; is there a relationship between the number of expulsions and the student's place of residence?

MATERIALS AND METHODS

The Moscow Polytechnic University teaches many professions necessary for the digital economy and industry of the Russian Federation. As part of the Development Program, the university develops curricula and trains specialists based on the needs of employers, data from the analysis and monitoring of the demand for personnel, including within the framework of the federal project "Personnel for the Digital Economy". The largest area of study at the Moscow Polytechnic University in terms of the number of students is "Computer Science and Computer Engineering" (20% of all the students). The university is increasing the number of students studying in IT areas, and their share in state-financed programs will be 35% by 2022. Due to an increasing educational interest in "Computer Science and Computer Engineering" and "Information Security" at the Moscow Polytechnic University, we select full-time students of these enlarged groups as an object for checking the relationship between the format of education, certification procedures, and students' progress.

The sampling included 4,018 students.

During the pandemic, distance learning at the Moscow Polytechnic University was organized as part of an electronic information and educational environment on the LMS Moodle platform.

The dynamics of students' progress were evaluated by comparing the number of expelled students before the transition to online education, during the period of distance learning, and when conducting classes in a mixed mode in the period 2018-2021.

RESULTS AND DISCUSSION

The total number of expelled students pursuing degrees in "Computer Science and Computer Engineering" and "Information Security" in the period from 2018 to 2021 is presented in Figure 1.
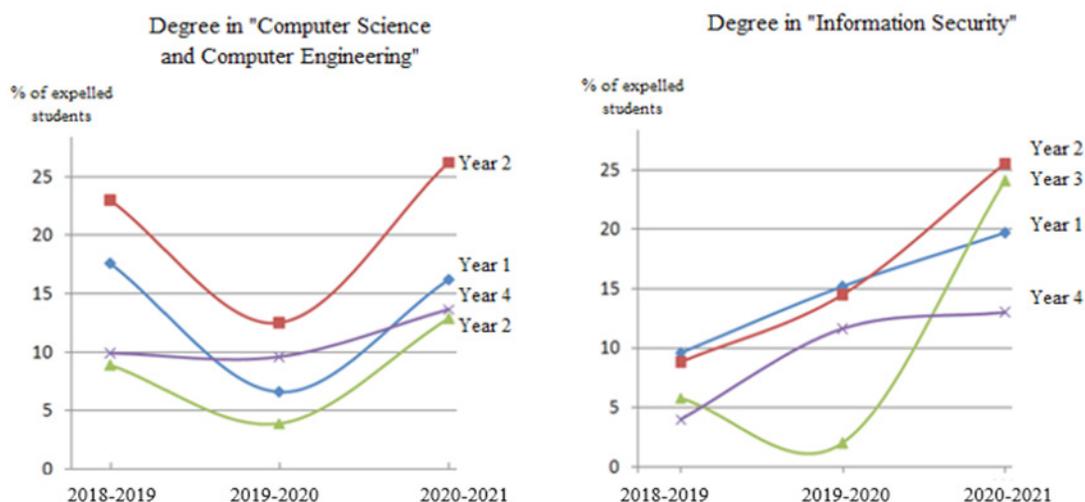

Figure 1. The number of expelled students of the 1st-4th year (% of the total number of students) from 2018 to 2021.

Figure 1 demonstrates that the number of students expelled in the period from 2018 to 2021 did not increase linearly. For example, 60 sophomore students pursuing a degree in "Computer Science and Computer Engineering" were expelled in 2018-2019 (23% of the total number of students in the 2nd year of the program). In the 2019-2020 academic year, 37 sophomore students were expelled (12.5% of the total number of students in the 2nd year of the program). In the 2020-2021 academic year, the number of expelled students reached 94 people (26.3%). The data shown in Fig. 1 proves that mostly freshman and sophomore students get expelled. The fact that the largest number of students drop out in the first year of their study is confirmed by the results of foreign studies (Harvey et al., 2006; Willcoxson et al., 2011; Kondratjeva et al., 2017; Zaj c & Komendant-Brodowska, 2018; Vilkova et al., 2021).

According to Figure 1, the number of expelled students in the field of "Computer Science and Computer Engineering" decreased and slightly increased in the field of "Information Security" during the transition to distance learning caused by quarantine measures in Moscow (the 2019-2020 academic year). After the end of the quarantine in the fall of the 2020-2021 academic year, the number of students who dropped out has almost doubled compared to the 2018-2019 academic year.

A decrease in the number of expelled students during the quarantine does not indicate an increase in their progress during the transition to distance learning since the university administration decided to postpone expulsions at the initiative of the educational organization (for academic failure or violation of the contract terms) until the quarantine was released.

For a better understanding of the dynamics of academic performance, it is necessary to study the reasons for expulsions between 2018 and 2021. Tables 1 and 2 provide the number of expelled students in absolute terms (people) and as a percentage of the total number of students in each year of the program.

Table 1. Analyzing reasons for the expulsion of students pursuing a degree in «Computer Science and Computer Engineering» from 2018 to 2021.

Academic year	Number of students as of October 1, 2021	Number of expelled students	AF	OR	T	Other reasons
2018-2019	895	147 (16.4%)	115 (12.8%)	23 (2.5%)	10 (1.1%)	0 (0%)
2019-2020	1030	84 (8.2%)	41 (4.0%)	35 (3.4%)	7 (0.7%)	1 (0.1%)
2020-2021	1325	236 (17.8%)	163 (12.3%)	60 (4.5%)	13 (1.0%)	0 (0%)

where AF is the number of expelled students because of academic failure;

OR is the number of students expelled at own request;

T is the number of expelled students since they decided to transfer to another educational institution.

The group of students is presented in accordance with the annual report under form No. VPO-1 "Information on the organization conducting educational activities in higher education programs: Bachelor's, Master's, and Specialist's degrees".

Table 2. Analyzing reasons for the expulsion of students pursuing a degree in «Information Security» from 2018 to 2021.

Academic year	Number of students as of October 1, 2021	Number of expelled students	AF	OR	T	Other reasons
2018-2019	243 (100%)	18 (7.4%)	18 (7.4%)	0 (0%)	0 (0%)	0 (0%)
2019-2020	257 (100%)	31 (12.1%)	18 (7%)	12 (4.7)	1 (0.4%)	0 (0%)
2020-2021	268 (100%)	55 (20.5%)	33 (12.3%)	16 (6.0%)	6 (2.2%)	0 (0%)

The data (Tables 1 and 2) shows that the largest number of students were expelled at their own request or for academic failure. Moreover, the number of academic dismissals from the program "Computer Science and Computer Engineering" during the quarantine decreased from 12.8 to 4%, which was primarily due to the initiative of the educational organization to create the most favorable conditions for the elimination of academic debts. The number of voluntarily expelled students steadily increased both during the quarantine and after it from 2.5 to 3.4 and 4.5%, respectively. The number of students pursuing a degree

in "Information Security" and expelled at their own request increased from 0 to 16% over this period.

Based on the research (Bekova et al., 2020), we suggested that the isolation of students, including the organization of their workspace during online training, could presuppose the effectiveness of online and mixed-mode learning. One of the reasons for the expulsion of students could be living in a dormitory during the period of distance learning. In this regard, we check whether there is a relationship between the number of expulsions and the student's place of residence. To do this, we conducted a quantitative analysis of academic dismissals and voluntary expulsions with due regard to the student's region of residence. To achieve the task, all the expelled students were divided into three groups: 1) students permanently registered in Moscow; 2) Moscow Oblast; 3) constituent entities of the Russian Federation, excluding foreign citizens (Table 3).

Table 3. The expulsion of students pursuing a degree in «Computer Science and Computer Engineering» with due regard to their region of residence.

Academic year	Expulsion for academic failure			Expulsion at own request		
	Moscow	Moscow Oblast	Regions	Moscow	Moscow Oblast	Regions
2018-2019	34 (3.8%)	24 (2.7%)	57 (6.3%)	11 (1.2%)	4 (0.4%)	8 (0.9%)
2019-2020	14 (1.4%)	5 (0.5%)	22 (2.1%)	17 (1.7%)	2 (0.2%)	16 (1.5%)
2020-2021	60 (4.5%)	30 (2.3%)	73 (5.55%)	26 (1.9%)	9 (0.7%)	25 (1.9%)

Tables 3 provide data on expelled students in absolute terms and as a percentage of the total number of students in a particular field of study within the academic year as of October 2021.

The analysis of the data (Tables 3) show that the number of voluntarily withdrawn students increased among those who came to study at the university from the constituent entities of the Russian Federation from 0.9% to 1.9% in the field of "Computer Science and Computer Engineering" and from 0% to 3% in the field of "Information Security" during the quarantine and after it.

This might be conditioned by the reluctance of some students to study online (Bekova et al., 2020). Both Russian and foreign studies show that students during the quarantine had personal and financial problems, which negatively affected their desire to get an academic degree (Vilkova et al., 2021). According to the students, a decrease in motivation and the lack of feedback from teachers become

the main reasons for voluntary withdrawals (Shcheglova et al., 2020). A large number of expelled freshman and sophomore students proves that students, especially junior students living in a dormitory, need to attend offline classes in order to interact with the teacher and their fellow students.

CONCLUSIONS

The analysis of expulsions demonstrated that the dropout rate of students was approximately the same before the introduction of quarantine measures, during the transition to distance learning and studying in a mixed format. In 2020-2021 academic year, a slight increase in expulsions was caused by the introduction of administrative measures to defer them during the quarantine. However, the number of students giving up studies at their own request increased during the quarantine period and after it.

We concluded that the university administration needs to monitor students at risk, develop and implement support measures, encourage interest in learning, and invest in academic services aimed at underperforming students.

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REFERENCES

Bekova, S. K., Vilkova, K. A., Dzhafarova, Z. I., Larionova, V. A., Maloshonok, N. G., Semenova, T. V., Chirikov, I. S., & Shcheglova, I. A. (2020). *Onlain bez paniki. Modeli i effektivnost vnedreniya massovykh onlain-kursov v rossiiskikh universitetakh [Online, don't panic! Models and effectiveness of integration of massive open online courses into Russian universities]*. National Research University Higher School of Economics.

Bugrov, A. C., & Krepets, I. V. (2020). Analiz rezultativnosti organizatsii elektronnogo obucheniya v sisteme srednego professionalnogo obrazovaniya v period samoizolyatsii [Analyzing the effectiveness of e-learning in the system of secondary vocational education during self-isolation]. *Professionalnoe obrazovanie i rynok truda, 2(41),* 55–57.

Chernykh, A. V., Sudakov, D. V., & Sudakov, O. V. (2020). *Otsenka uspevaemosti studentov meditsinskogo vuza v period distantsionnogo obucheniya [Assessing the academic performance of medical students during distance learning]*. In, V. I., Starodubov, and V. A. Tutelyan, (eds.) *Aktualnye problemy obrazovaniya i zdorovya obuchayushchikhsya*. (pp. 97–117). Nauchnaya kniga.

Chirikov, I., Semenova, T., Maloshonok, N., Bettinger, E., & Kizilcec, R. F. (2020). Online education platforms scale college STEM instruction with equivalent learning outcomes at lower cost. *Science Advances, 6(15)*, 1–10.

Harvey, L., Drew, S., & Smith, M. (2006). *The first-year experience: A review of literature for the Higher Education Academy*. The Higher Education Academy.

Klyagin, A. V., Abalmasova, E. S., Garev, K. V., Gruzdev, I. A., Egorov, A. A., Zakharova, U. S., Kalinin, R. G., Kamaldinova, L. R., Karlov, I. A., Korneeva, I. E., Makareva, A. Yu., Minaeva, E. A., Platonova, D. P., Semenova, T. V., Skokova, Yu. A., Terentev, E. A., Frumin, I. D., Shvindt, A. N., & Shibanova, E. Yu. (2020). Shtorm pervykh nedel: Kak vysshee obrazovanie shagnulo v realnost pandemii) [The storm of first weeks: How higher education faced the pandemic]. *Seriya Sovremennaya analitika obrazovaniya [Series The modern analytics of education], No. 6(36)*. National Research University Higher School of Economics.

Kondratjeva, O., Gorbunova, E., & Hawley, J. D. (2017). Academic momentum and undergraduate student attrition: Comparative analysis in US and Russian universities. *Comparative Education Review, 3,* 607–633.

Larionova, V. A., Semenova, T. V., Shmeleva, E. D., Daineko, L. V., Yurasova, I. I. (2020). Vynuzhdennyi perekhod na distantsionnoe obuchenie: Ozhidaniya i opaseniya studentov [Forced transition to distance learning: Expectations and fears of students]. *Universitetskoe upravlenie: Praktika i analiz, 24(4),* 22–29.

Lomovtseva, N. V. (2009). Kontrol uchebnoi deyatelnosti v distantsionnom obuchenii [Controlling the educational process during distance learning]. *Ekonomika obrazovaniya, 2*, 93–94.

Mamchik, N. P., Mazina, O. L., & Gabbasova, N. V. (2020). *Sravnitelnyi analiz rezultatov obucheniya studentov pri ochnoi i distantsionnoi forme obucheniya [The comparative analysis of students attending traditional classes and involved in distance learning]*. In, V. I., Starodubov, and V. A. Tutelyan (eds.) *Aktualnye problemy obrazovaniya i zdorovya obuchayushchikhsya*. (pp. 118–134). Nauchnaya kniga.

Mamchik, N. P., Mazina, O. L., & Gabbasova, N. V. (2021). *Otsenka rezultatov obucheniya studentov v period perekhoda na distantsionnuyu formu obucheniya [Evaluating students' results during the transition to distance learning]*. In, Zh. V. Murzina, (ed.) *Pedagogika, psikhologiya, obshchestvo: Novaya realnost*. (pp. 124–129). Cheboksary: LLC Publishing House Sreda,

President of the Russian Federation. (2018). *On national goals and strategic tasks of developing the Russian Federation until 2024*. https://rg.ru/2018/05/08/president-ukaz204-site-dok.html

Pyatibrat, E. D., Gordienko, A. V., Sorokin, N. V., & Pyatibrat, A. O. (2021). Psikhofiziologicheskie osobennosti distantsionnogo obucheniya [Psychophysiological features of distance learning]. *Vestnik psikhoterapii, 78(83),* 126–134.

Shcheglova, I., Gorbunova, E., & Chirikov, I. (2020). The role of the first-year experience in student attrition. *Quality in Higher Education, 26(3),* 307–322.

Shmeleva, E. D., & Frumin, I. D. (2020). Faktory otseva studentov inzhenerno-tekhnicheskogo profilya v rossiiskikh vuzakh [The factors of expelling students pursuing an engineering or technical degree in the Russian unversitites]. *Voprosy obrazovaniya, 3,* 110–136.

Shukhman, A. E., Parfenov, D. I., Legashev, L. V., & Grishina, L. S. (2021). Analiz i prognozirovanie uspevaemosti obuchayushchikhsya pri ispolzovanii tsifrovoi obrazovatelnoi sredy [The analysis and forecast of academic performance in the context of the digital educational environment]. *Vysshee obrazovanie v Rossii, 30*, 8–9.

Vilkova, K., Shcheglova, I., Dremova, O. (2021). The challenges of distance learning to student mental health. *Higher Education in Russia and Beyond, 27(2),* 12–14.

Willcoxson, L., Cotter, J., & Joy, S. (2011). Beyond the first-year experience: the impact on attrition of student experiences throughout undergraduate degree studies in six diverse universities. *Studies in Higher Education, 36(3),* 331–352.

Zaj c, T. Z., & Komendant-Brodowska, A. (2018). Premeditated, dismissed and disenchanted: higher education dropouts in Poland. *Tertiary Education and Management 25(1),* 1–16.

Zueva, E. A., & Vinogradova O. N. (2021). *Vliyanie distantsionnogo obucheniya na uspevaemost studentov [The impact of distance learning on academic performance]*. In, O. V., Trufanova and G. V. Voloshina (eds.). *Dni nauki i innovatsii NovGU*. (pp. 114–118). Novgorod State University named after Yaroslav the Wise.