

THE IMPACT OF COVID-19 PANDEMIC ON U.S. STUDENTS' ACADEMIC PERFORMANCE

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ABSTRACT

In this study, we aim to understand the effects of COVID-19 pandemic on academic performance of college students in the United States with a case study of the University of Houston-Clear Lake (UHCL). COVID-19 pandemic affects many aspects of the society, including the higher education sector. We administrate a survey among UHCL students. Findings include that UHCL students' academic performance is impacted by COVID-19 pandemic. Average Grade Point Averages (GPAs) of participants show a slightly decreasing trend from Fall 2019 to Fall 2020 and students experienced mental health issues such as perceived lacking behind the study and elevated level of anxiety and nervousness.

Keywords: COVID-19 pandemic; college student; academic performance, mental health; self-motivation and self-regulation.

INTRODUCTION

COVID-19 (Corona Virus Disease 2019) is a highly infectious disease with a varying length of incubation period when the infected might not demonstrate symptoms but spread the disease without awareness. The virus responsible for this disease is Sars-Cov-2 (Severe Acute Respiratory Syndrome Coronavirus 2) [19]. The uncertainty and high contagious nature of the disease not only bring a heavy toll on people's physical health but also significantly impact people's mental health, causing anxiety and stress. In efforts to reduce the spread of COVID-19, campus closure has been implemented across the United States and almost all institutions of higher education transition to remote teaching to a certain degree. A number of virtual alternatives are implemented to continue teaching activities.

As education lays the foundation of the operations in a society, negative events impacting education could have severe short-term and long-term impacts. Natural hazards induced by climate changes and other threats are generating significant challenges in maintaining a productive educational context in the U.S., where more than 50 million people with the majority being children devote approximately a third of their day time. Natural disasters and pandemics such as COVID-19 constrain most educational institutions to transition to remote instructional delivery mode from a typically face-to-face delivery mode [9]. Transitioning to online education often mandates dramatic changes in the educational infrastructure and causes numerous difficulties for educators and their institutions. In addition, students have a wide

spectrum of knowledge on online learning and could be lost in abundant online learning resources. Therefore, a significant number of students have to explore a challenging and unfamiliar territory during COVID-19 pandemic. These new challenges might have negative impacts on their academic performance.

The objective of this paper is to understand their impacts on college students' academic performance using UHCL as a case study. The impacts are likely to differ by students dependent upon the student's specific circumstances in terms of academic preparation, physical and mental health status prior to the pandemic. Academic preparation refers to the prior official trainings that a student has obtained in different bodies of knowledge, and associated with the students' reliance on the integrated educational system. The concept of integrated education system stresses approaches that perceive the student from a holistic perspective [12]. The aim concerns not only reaching a satisfactory career or a high salary, but also development of a well-being person. Individual components of a person (e.g., physical body, cognition, emotion, and spirit) would evolve simultaneously and be integrated into a complete person. The dependence denotes the extent of a student to achieve strong motivation, knowledge and skill acquisition by relying on elements of the educational system such as a teacher or a tutor. Some students could act more independently as compared to others and thus are more capable of coping with challenging circumstances than more dependent students.

RESEARCH QUESTIONS

Due to the COVID-19 pandemic, most educational institutions were locked down to slow the COVID-19 spread. Therefore, most institutions alter their educational delivery mode from face-to-face to online or remote. A significant number of students were already familiar with the online delivery mode due to the growth in online education over the past decades. However, administrating online teaching in such a large extent was first in the record, driving some educational instructions with little previous experience to rapidly change to online teaching mode. For example, in the spring of 2020, COVID-19 significantly changed the method that children were taught. Over 80 percent of students used online learning mode and resources [24]. The objective of this paper is to identify the relationship between the COVID-19 pandemic and students' academic performance, who are required to learn completely online. In addition, we explore students' perceived quality of their learning and satisfaction levels with online courses in higher education. The results could yield some valuable insights to policy makers in developing policies to alleviate the negative impacts of COVID-19 pandemic on students' academic performance. The following research questions are addressed: (1) what are the impacts of COVID-19 pandemic on students' academic performance in higher education? and (2) How effective were some policy changes and online teaching from students' perspective?

LITERATURE REVIEW

Impacts by Natural Disasters on Students' Learning

Disruption to education could result from both natural (e.g., floods, earthquakes, and epidemics/pandemics) and man-made disasters (e.g., explosions, bioterrorism attacks, and exposure to sources of ionizing radiation). A current concern is the negative effects of disasters on human capitals [4].

Disasters could influence the education of affected children in a number of ways. First, disasters could lead to diseases and fatalities for the families, which could impact children's education in a direct manner. A number of studies identify long-term adverse impacts of disasters on children's health [18]. Second, disasters could damage educational infrastructures (e.g., campuses and classrooms) and increase the educational costs, and decrease educational accessibility. Third, disasters could lead to significant financial losses for the children's families. A dramatic reduction in family income could force parents to decrease educational expenditure for their children, and obtain extra wages by relying on children's labor [8][17]. In addition, disasters could negatively affect students in colleges and universities. Over 50,000 college students in New Orleans, whose campuses were damaged by high flooding and strong winds in Hurricane Katrina, were unable to study for that entire semester [16]. L'Aquila earthquake might decrease the probability of students graduating on-time and slightly increase the probability of students dropping out [10]. Beside primary damages, natural disasters such as hurricanes could have secondary impacts on students as well [15].

Online Teaching Mode

Immediately following natural disasters, online teaching provides a practical option to secure the educational continuity. In traditional teaching, the instructor and students meet face-to-face in a physical classroom, and all learning materials are distributed physically without using any online resources [2]. In contrast, online teaching efforts could contain a spectrum of resources, multi-media, techniques, interactivity with instructors and fellow students with Web technologies, and particularly adaptive curricular or pedagogical methods to deliver teaching contents. Online learning affords students the opportunities to access online courses without the constraints of time and space given that they have adequate access to the Internet. Online learning generally happens in an either asynchronous or synchronous arrangement. In asynchronous class meetings, students in distant places study independently at different times of their choices, typically supported by a tutor or instructor. In synchronous class meetings, more than one classroom in distant places are participating simultaneously and operated synchronously following the lead of an initiating place. In online learning, such platforms as WebCT, Canvas, Blackboard, and Moodle are usually utilized by colleges and universities to support either synchronous online class meetings or material distribution [22]. Online teaching materials could be designed and developed by individual instructors, instructional designers, or commercial suppliers. They could be developed in house, purchased, or leased, depending on who develops them. A number of states, independent school districts, and schools have generated individual online course development standards. Most courses in online programs are aligned with standards for quality control established by school districts in the U.S. Isolated states, companies, and schools assess the quality of their online academic programs independently.

Advantages of Online Learning

Online learning brings a number of advantages over traditional learning. Some advantages include flexibility in time and space, convenience, avoidance of the commute to campus, a large course selection, lifetime learning, social access and equity, more access to advanced knowledge and skills, cost savings, and materials with multimedia [5]. Online learning could achieve the same level of effectiveness as the

traditional and face-to-face learning in classrooms in terms of students' academic performance [21]. Viewing online learning as an inherently diverse, cooperative, and social process, some researchers have summarized the benefits of online learning as follows: (1) profound understanding of information, active and constructive learning, enhanced personal accomplishment [1], (2) enhance retention of knowledge, improved skills in communication [7], and (3) critical thinking, development of pro-social perspective and a collaborative characteristic, enhanced learning motivation, idea diversification, and long-term student retention [14].

Disadvantages of Online Learning

In spite of the quick spread in popularity and evolution of online learning, especially Web-based learning programs, a number of criticisms of online learning involve the honesty and efficacy of online learning. These criticisms consist of the isolated learning contexts, the degree of appropriateness of online learning materials, and the non-existence of face-to-face communication. Teachers have a debate regarding interactivity with some casting doubts on the quality of courses delivered purely online. Some claim that duplicating the classroom learning context on the Web is challenging in the sense of richness in media and social presence. There are difficulties with plain text-based media and the removal of nonverbal communication. Technologies involving multi-media could provide multi-sensory experiences to support learning experiences. With the flexibility in the online learning space, students might have a difficult time motivating themselves to make time commitments to their studies. Instructions delivered by a digital device could cause distraction when the student do not have a strong motivation to study within the isolated space. Therefore, the students' success in online learning might rely on students' motivation and perceptions of online courses.

Impact by Public Health Disasters on Students' Performance

The majority of educational institutions in the global shut down their campuses in March 2020 in efforts to stop or slow the spread of the COVID-19. Portions of the educational system did not resume operations for this academic year in several countries, while a variety of new operations modes were observed in other portions of the educational system. A national survey of 3,300 young students aged between 13 and 19 shows that school closure could have a lasting negative impact on young students along social, emotional and academic dimensions [23]. Whereas the interruption to students' learning triggered by COVID-19 pandemic is extraordinary, valuable lessons regarding its influences on learning could be obtained based on results from related research prior to COVID-19 pandemic. Campus closure and the resort to online learning might be detrimental to students' learning in four manners: (1) less time available for learning, (2) disaster-induced stress, (3) a modification to interactivity, and (4) the absence of motivation to learn.

METHODS

We conducted a questionnaire-based survey that consists of twenty-three questions with the help of UHCL faculty from different programs, departments and colleges in distributing the survey to their graduate

and/or undergraduate students. Also, the research received approval from the university's institutional review board and an informed consent form was attached to the questionnaire in the survey, and each participant gave consents to participate in the survey after reading the consent form. The survey was published using the online survey platform Qualtrics from February 7th, 2021 to February 28th 2021 to ensure that we would collect a sufficient amount of data for the study. The questionnaire consists of both open-ended and close-ended questions. It was divided into two specific sections. The first section was general information such as the major of study, education's status of respondents (i.e., graduate vs. undergraduate and domestic vs. international), age group, gender, and the devices used for taking the online courses at UHCL. The second section consists of the questions related to readiness, satisfaction/unsatisfaction of students of the learning materials, efficiency of online resources and materials, instructional design and delivery, and learning outcomes/feedback of the participants. We removed some outliers (for instance some of the students mentioned their GPAs were over 4.0 or negative and some of them abandoned the survey in the middle).

RESULT

Participants

Of the 326 university students initially participated in the survey, nine retreated as they did not complete the consent form. Also, a total of 108 of participants with missing data was excluded, and data from 209 participants was used in the analysis. Table 1 shows the demographics of the included participants. Female participants (142 or 67.9%) were approximately more than two times of male participants (64 or 30.6%), and three students (1.4%) preferred not to reveal their gender. The largest groups of participants aged between 22 and 25 years old (i.e., 65 students or 31.1%) and between 18 and 21 years old (i.e., 45 students or 21.5%). Approximately, 60% of the participants were undergraduate students. The number of participants from the college of business was 68 (32.5%) and that from the college of science and engineering was 59 (28.2%). Approximately 23.9% of participants have a family income of \$20,000 and less. According to the U.S. census, median household income (in 2019 dollars) in the city of Houston was \$52,338. Therefore, based on the collected data, approximately 50% of the participants' household income was under the average.

Table 1 Demographics of the participants

Variable	Response	Frequency	Percentage
Gender	Female	142	67.9%
	Male	64	30.6%
	Not to Say	3	1.4%
Age	18-21 years old	45	21.5%
	22-25 years old	65	31.1%
	26-29 years old	31	14.8%
	30-33 years old	30	14.4%
	34 and over	38	18.2%
Education Status	Undergraduate	125	59.8%
	International Undergraduate	1	0.5%
	Graduate	75	35.9%
	International Graduate	8	3.8%

Major (Home college)	College of Business	68	32.5%
	College of Education	30	14.4%
	College of Human Sciences and Humanities	52	24.9%
	College of Science and Engineering	59	28.2%
Family Income	Under \$20,000	50	23.9%
	\$20,001-\$40,000	41	19.6%
	\$40,001-\$60,000	28	13.4%
	\$60,001-\$80,000	40	19.1%
	\$80,001-\$100,000	13	6.2%
	\$100,001 and over	37	17.7%

According to the data collected, most of the students (200; 95.7%) used their own laptops to participate in online learning during the pandemic of COVID-19. During the COVID-19 pandemic, students could connect remotely to the UHCL lab computers to serve their needs for some specific software based on their majors. In addition, the school provided a one-time reimbursement for up to 80% of eligible expense toward the purchase of a laptop/desktop/tablet for the students have active FAFSA or TASFA on file with the Financial Aid department, which was helpful for students with a problem to purchase a computer to support online learning.

Physical and Mental Health

According to the data, a total of 157 (75.1%) students mentioned that they had not experienced any physical issue during the pandemic of COVID-19. In contrast, more than 63% (132) of participants stated that they experienced a mental issue. Motivation of students, concentration, and social interaction were the factors that had more effects on the academic success of students in higher education. Mental health issues could exaggerate these factors. Therefore, mental health issues during the pandemic of COVID-19 might be a significant factor in determining students' academic success.

Taking Care of Family and Financial Difficulty

During the pandemic, some students had to take care of their family members or friends, who were infected by COVID-19. From 209 participants, a total of 117 (56%) of students mentioned that they did not take care of their families or friends during the pandemic. Approximately, 62% of the students expressed their concerns about financial difficulty caused by COVID-19 pandemic. A total of 21% of participants sometimes experienced this problem, 26.8% often had the financial difficulty and almost 14% of them always experienced the problem during the COVID-19 pandemic. According to the Financial Aid department at UHCL, in year 2019, two of three UHCL students received some types of financial aids. Therefore, the self-reported data was consistent with the official data.

Pressure about Grades among Peers and Lagging behind the Study

Based on the collected data, a total of 147 (75.3%) of participants experienced pressure about their grades among peers during the pandemic of COVID-19. Out of the 209 participants, a total of 176 (84.3%) stated that the pandemic had led to lagging behind the study. Both mentalities could lead to an increase in stress and anxiety.

Increased Anxiety and Nervousness Level

Based on the literature review, an increased level of anxiety and nervousness was the most significant impact during a pandemic. The data showed that when asked about the impact of COVID-19 pandemic on the level of anxiety and nervousness, a total of 39.7% (83/209) mentioned that they were experiencing definitely increased levels of anxiety and nervousness. Also, approximately 37% of other students experienced some level of anxiety.

Lack of Self-Motivation and Self-Regulation

Self-motivation or motivation was what pushed people to achieve their goals and missions and led to better feeling in life. For instance, it could lead to being optimistic and persistent in pursuing goals against some failures. Also, people with strong self-motivation could take control of many aspects of their lives. Self-regulation shared some common factors with different meanings. Self-regulation was the process and ability that students understood and managed their behavior to take control and evaluate their own learning. In this process, students used different techniques such as questioning to approach academic tasks. More than two thirds of the participants (159/209; 76.1%) described that the pandemic resulted in significant lack of self-motivation and self-regulation. Learning from home could be the reason that led to lack of students' self-motivation and self-regulation.

Amount of Time that Students Spent on Self-study

More than half of the participants (108/209; 51.7%) stated that time of their self-study during the pandemic increased. A total of 58 (27.8%) of students mentioned that the time that they spent during the COVID-19 pandemic and before that was completely the same. Only 43 (20.6%) of the 209 participants experienced a decrease in their self-study time.

Interim Grading Policy (Satisfactory/Unsatisfactory)

During the pandemic of COVID-19, many schools in the U.S. such as UHCL implemented a new policy of grading for their students. Grading policies have been shown to impact students' academic performance [11]. The intention of the new policy was to release some stress caused by the COVID-19 pandemic. A large portion of participants (154/209; 73.7%) described that interim grading policy (satisfactory/unsatisfactory) had no effect on their eagerness to study more. In contrast, a total of 35 participants (16.8%) stated that the new policy had a positive effect on their education. In addition, a total of 9.5% of the participants stated the new policy had a negative impact on their education.

Adverse Impacts on Grades

According to the participants' responses about experiencing adverse impacts on their grades because of the transition to online learning from face-to-face mode, more than half of the participants (119/209; 55.5%) described that changing mode to online learning had an adverse impact on their grades. Of the 119 participants, a total of 45 of stated that this change definitely had a negative effect on their grades. Also, a total of 23% of the participants stated that this transition had definitely no impact on their grades. However, it should be mentioned that 47 of the 209 participants had not completed three consecutive semesters at UHCL (from Fall 2019 to Fall 2020). It implied that for 47 of them, fall 2020 was their first or second semester at UHCL. Therefore, if we exclude these participants, the distribution of students' responses would change. Based on the newly excluded data, a total of 92 (56.9%) of the 162 participants stated that transition to online learning had an adverse impact on their grades. Also, a total of 23% of the participants mentioned that the changing mode definitely had no effect on their grades. Figure 1 shows the distribution of self-reported GPAs in the three consecutive semesters from the pre-pandemic one (Fall 2019) to the two during the pandemic (Spring 2020 and Fall 2020). We found that the variation in GPA appeared to increase from pre-pandemic to pandemic semesters. Less students were achieving a grade of 4.0 and more students were receiving a failing grade (2.0 and less). It implied that not all students were equally affected by the pandemic in terms of their academic performance.

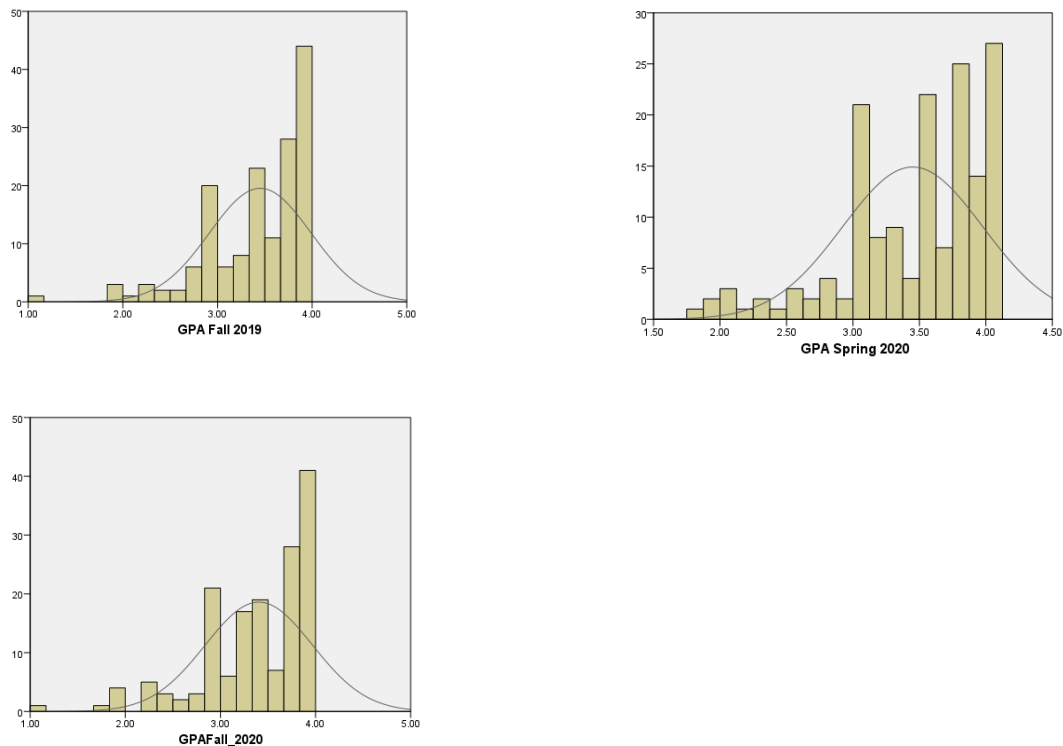


Figure 1. Distribution of GPAs in the three consecutive semesters: (a) Fall 2019, (b) Spring 2020, and (c) Fall 2020.

CONCLUSION

COVID-19 pandemic had a profound effect upon students' learning in institutions of higher education. In this study, we surveyed 209 college students at the University of Houston-Clear Lake to understand the impacts of COVID-19 pandemic on students' academic performance.

From the study, students experienced different levels of anxiety and nervousness as possibly related to their family incomes. In other words, the students with a higher household income generally experienced lower anxiety than the ones with medium and low family incomes. Average GPAs of students during the three consecutive semesters from Fall 2019, Spring 2020, and Fall 2020 slightly decreased. However, the standard deviation of GPAs fluctuated between Fall 2019 and Spring 2020. In the subsequent semester, it increased and that demonstrated dispersion of grades which was increased from Spring 2020 (the semester that COVID-19 crisis started) to Fall 2020. In particular, less students were achieving a grade of 4.0 and more students were receiving a failing grade (2.0 and less). It implied that not all students were equally affected by the pandemic in terms of their academic performance. A further analysis and more data collection were needed to understand this educational disparity in order to develop targeted interventions to achieve educational equity. The satisfactory/unsatisfactory grading policy has limited impacts on students' learning.

There are several interesting future research directions. First, we would perform extensive statistical analyses to understand the correlations among the different variables of interest. Second, we would conduct a clustering study to categorize students into different groups and explore the group characteristics [13]. Finally, we would analyze and visualize of the collected data with Statistical Package for the Social Sciences (SPSS) (IBM SPSS v.26) [20].

REFERENCES

- [1] Abrami, P.C., & Bures, E.M. Computer-supported collaborative learning and distance education. *American Journal of Distance Education*, 1996, 10(2), 37-42.
- [2] Allen, I.E., and Seaman, J. 2008. Staying the course: Online education in the United States, 2008, Retrieved June 12, 2020, from <http://www.sloan-c.org/publications/survey/staying%5fcourse>
- [3] Anderson, T. (Ed.). The theory and practice of online learning. Athabasca University Press, 2008.
- [4] Baez, J., De la Fuente, A., & Santos, I. Do natural disasters affect human capital? An assessment based on existing empirical evidence (IZA Discussion Paper No. 5164). Bonn, Germany: IZA (Institute of Labor Economics), 2010.
- [5] Bates, A. W., & Bates, T. Technology, e-learning and distance education. *Psychology Press*, 2005.
- [6] Bernard, R. M., Brauer, A., Abrami, P. C., & Surkes, M. The development of a questionnaire for predicting online learning achievement. *Distance Education*, 2004, 25(1), 31-47.
- [7] Cho, W., Schmelzer, C.D., & McMahan, P. S. Preparing hospitality managers for the 21st century: The merging of just-in-time education, critical thinking, and collaborative learning. *Journal of Hospitality & Tourism Research*, 2002, 26(1), 23-37
- [8] De Janvry, A., Finan, F., Sadoulet, E., & Vakis, R. Can conditional cash transfer programs serve as safety nets in keeping children at school and from working when exposed to shocks? *Journal of Development Economics*, 2006, 79(2), 349-373.
- [9] Dhawan, S. Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, 2020, 49(1), 5-22.

- [10] Di Pietro, G. The academic impact of natural disasters: evidence from L'Aquila earthquake. *Education Economics*, 2018, 26(1): 62-77.
- [11] Elikai, F., & Schuhmann, P. W. An examination of the impact of grading policies on students' achievement. *Issues in Accounting Education*, 2010, 25(4), 677-693.
- [12] Fan, M. The idea of integrated education: From the point of view of Whitehead's philosophy of education. Paper presented at the Forum for Integrated Education and Educational Reform sponsored by the Council for Global Integrative Education, Santa Cruz, CA, October 28-30, 2004. URL <http://www.cgie.org/blog/resources/papers-publications/idea-integrated-education-point-view-whiteheads-philosophy-education/> Retrieved October 10, 2021.
- [13] Filaire, T. Clustering on mixed type data. *Medium*. 2018, URL: <https://towardsdatascience.com/clustering-on-mixed-type-data-8bbd0a2569c3> Retrieved October 10, 2021.
- [14] Flynn, J.L. Cooperative learning and Gagne's events of instruction: A syncretic view. *Educational Technology*, 1992, 32(10), 53-60.
- [15] Gill, D. A. Secondary trauma or secondary disaster? Insights from Hurricane Katrina. *Sociological Spectrum*, 2007, 27(6), 613-632.
- [16] Gill, D. A., Ladd, A. E., & Marszalek, J. College students' experiences with Hurricane Katrina: A comparison between students from Mississippi State University and three New Orleans universities. *Journal of the Mississippi Academy of Sciences*, 2007, 52(4), 262-281.
- [17] Grootaert, C., & Kanbur, R. Child labour: A review (Policy Research Working Paper No. 1454), *The World Bank*, 1995.
- [18] Hoddinott, J., & Kinsey, B. Child growth in the time of drought. *Oxford Bulletin of Economics and Statistics*, 2001, 63(4), 409-436.
- [19] Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., ... & Cao, B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*, 2020, 395(10223), 497-506.
- [20] IBM SPSS Statistics (Version 26) predictive analytics software. URL: <https://www.ibm.com/us> Retrieved October 10, 2021.
- [21] Johnson, S. D., Aragon, S. R., Shaik, N., & Palma-Rivas, N. Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face learning environments. *Journal of Interactive Learning Research*, 2000, 11(1), 29-49.
- [22] Kaya, M. Distance education systems used in universities of Turkey and Northern Cyprus. *Procedia-Social and Behavioral Sciences*, 2012, 31, 676-680.
- [23] Margolius, M., Doyle Lynch, A., Pufall Jones, E., & Hynes, M. The State of Young People during COVID-19: Findings from a Nationally Representative Survey of High School Youth. America's Promise Alliance, 2020.
- [24] McElrath, K. Schooling during the COVID-19 pandemic. United States Census Bureau, 2020. <https://www.census.gov/library/stories/2020/08/schooling-during-the-covid-19-pandemic.html> Retrieved October 10, 2021.