Journal of Learning and Teaching in Digital Age, 2023, **8**(1), 161-168
https://dergipark.org.tr/en/pub/joltida
ISSN: 2458-8350 (online)

Research Paper

Examination of Variables Affecting the Perceptions of Academic Performance of Higher Education Students during the Distance Education Process

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ARTICLE INFO

Received: 1 April 2022
Revised: 21 October 2022
Accepted: 22 October 2022

Keywords:
Academic performance
Distance education
Academic satisfaction
Higher education

doi: 10.53850/joltida.1097130

ABSTRACT

Covid-19 has had serious consequences in all areas of social life, including education. In this period, distance education appeared as an inevitable solution. Even today, when the pandemic process is over and re-normalization has begun, online teaching environments have become such an indispensable part of education systems that it has been decided that a certain proportion of the courses will be conducted online in universities. For this reason, determining student experiences in online courses is important in planning the future of distance education. Since academic performance is the output of the teaching process, students' academic performance is one of the topics of interest in higher education research. There may be different factors affecting the academic performance of students in the distance education process, which imposes more responsibility on students and requires self-control. This study aimed to examine the relationship of academic performance in the distance education with home infrastructure, student interaction, computer skills, academic satisfaction. This research is based on a large-scale study, "The impact of the Covid-19 pandemic on the lives of higher education students", examining the pandemic's impact on higher education student perceptions in 2020. It has been observed that home infrastructure has a significant impact on the student's academic performance. The infrastructure increases the interaction of the student. When home infrastructure is taken as a control variable, students' computer skills are the highest predictor of their perception of academic performance, followed by their online interactions and, finally, perceived satisfaction. Today, pandemic conditions are still ongoing. In addition, even as the pandemic ends, online education has become an indispensable part of our education system. Therefore, the findings of the research would be beneficial for the ongoing planning process.

INTRODUCTION

Covid-19, which caused the global pandemic, has caused serious negative consequences in all areas of social life, including education. In the face of the pandemic process, which has not ended after two years, countries are trying to normalize within certain limits and ensure the maintenance of the production and service sectors. Education, which affects the future and the current conditions of the citizens of the country, is a priority area that is tried to be maintained both during the pandemic and normalization. In order to prevent the spread of the virus during the pandemic process, higher education continued with distance education after a mandatory break. During this period, this compulsory preference was the most effective way for students to attend the classes. Today, online teaching environments have become such an inevitable part of education systems during the normalization process that even when the pandemic is over, it has been decided that a certain proportion of the courses will be conducted online in universities.

According to the International Association of Universities (IAU), more than one and a half billion students worldwide have been affected by the suspension of higher education courses due to the pandemic (IAU, 2020). With the help of online technologies to ensure continuity of learning, there has been a large transition to distance education. Higher education institutions in Turkey switched to distance education three weeks after a one-week break. 121 (64%) of higher education institutions started their education by distance education on 23 March 2020; 41 (21.6%) of them on 30 March 2020 and 25 (13.2%) on 6 April 2020 (Turkish Higher Education Board, 2020).

Before the pandemic, distance education or online learning platforms were used as a pillar of blended learning. The distance education process, which uses applications based on online interaction such as Microsoft Teams, google classroom, zoom, and blackboard, requires systematic planning and preparation. Because distance education is more than uploading learning resources to the system and presenting them to students, it is a learning process that gives students more autonomy, responsibility, flexibility, and choice. For this reason, the pandemic and the compulsory transition process, and distance education cannot be considered in the same context. It seems more appropriate to call this system, in which universities have made a compulsory transition as emergency

distance education or critical distance education (Hodges, Moore, Lockee, Trust & Bond, 2020; Sümer & Yüner, 2021). In this study, what distance education means is compulsory distance education.

The transition to distance education due to the pandemic caught most institutions unprepared. Both the lack of infrastructure of higher education institutions and the inexperience and unpreparedness of the instructors made the process difficult (Osman, 2020). In addition, the process necessitated a significant change in terms of students as well. While students attend classes from their homes, their interactions with their social environment have decreased, and their learning responsibilities have increased to a higher level (Aytaç, 2021). All these changes will affect students' experiences in the teaching process, their perceptions of the process, and ultimately their academic performance.

Students' academic performance is one of the subjects of interest in studies on higher education because academic performance is the output of the teaching process. In this direction, many studies have been conducted to explore the factors affecting the academic performance of university students. Among these studies, Hanson (2000) reported that student performance is affected by different factors such as learning abilities, gender, and race. Furthermore, Mckenzie and Schweitzer (2001) found that pre-university academic performance is the most important predictor of university performance. On the other hand, Hijazi and Naqvi (2006) reported that the attitude towards attending classes, the time allocated to the lessons, the parent's income level, the mother's age, and the mother's educational status are the main factors affecting the performance. Although it serves a common purpose, face-to-face and distance education teaching environments are different. Therefore, in these processes, the behaviors expected from the students also change. There may be different factors affecting students' academic performance in the distance education process, which imposes more responsibilities on students and requires self-control. The arrangement of educational environments is effective on learning outcomes. This also applies to online learning. How the education process is carried out affects the success of distance learning (Puljak, Čivljak, Haramina, Malisˇa, Čavić, Klinec, et al., 2020).

Many factors affecting learning performance in the distance education process have been studied in the literature. These studies show that online interactions (Kuo, Walker, Schroder, & Belland, 2014; Sher, 2009) the ability to use the computer effectively (Cidral, Oliveira, Di Felice & Aparicio, 2018; Wu, Tennyson & Hsia, 2010), teaching staff support (Cidral et al., 2018; Chopra, Madan, Jaisingh & Bhaskar, 2019; Joo, Lim& Kim, 2011), providing feedback (Chen, Breslow & DeBoer, 2018), technical support (Al -Fraihat, Joy & Sinclair, 2020; Cidral et al., 2018; Zhang & Goel, 2011) affect learning performance in distance education.
Participation affects learning, and effective institutions focus on students' participation. (Akpur, 2021; Astin, 1984; Lim & Fraser, 2018) The primary actors in ensuring student participation are the instructors. Academic counseling increases students' engagement with school and their resilience in the face of difficulties (Shahzadi, Erum & Ahmad, Z, 2011). Interactions with instructors, mainly focusing on intellectual or career-related issues, increase student participation and motivation (Astin, 1984; Pascarella, 1980; 1985; Terenzini, Pascarella& Lorang, 1982; Tinto, 1987). Another influential factor on student performance is the student's perceptions. If the student is satisfied with the learning environment and process and feels academic satisfaction, it will positively affect performance. Research in the literature reveals that there is a strong relationship between students' satisfaction with distance learning environments and their perceptions of academic performance (Sun, Tsai, Finger, Chen& Yeh, 2008; Eom, Wen& Ashill, 2006; Marks, Sibley & Arbaugh, 2005).

One of the factors affecting students' satisfaction in distance education is their computer skills. Cidral et al. (2018) revealed that students' ability to use digital learning platforms affects their distance education process. Similarly, Wu, Tennyson and Hsia (2010) emphasized computer skills in effective distance learning. Another critical factor affecting the distance education process is whether or not students have the necessary infrastructure and equipment for the course. The required infrastructure may differ according to the development level of the countries. Students' satisfaction with the distance education process is higher in developed countries than in developing countries (Abbasi, Ahmed, Sajjad, Alshahrani, Saeed& Sarfaraz et al., 2020). The main difference is the opportunities that can be had according to the level of development. In countries with shortages of financial resource, limited internet access, slow internet speed, high internet fees, and impaired functioning of digital platforms pose problems (Dutta & Smita, 2020). This leads to a decrease in student participation and performance. Similarly, Aung and Khaing (2018) revealed that compared the developing countries and developed countries, and active participation is low in developing countries due to the inadequacy of technological infrastructure and the inadequacy of information technology literacy of teachers and students.

Based on the results of the studies in the literature, in this study, it is assumed that the home infrastructure, student interaction, computer skills, and academic satisfaction will impact the perception of academic performance in the distance education process. Determining student experiences in online courses is important in planning the future. In this context, the current study aimed to examine the academic performance perceptions of higher education students in the distance education process. Answers to the following research questions were sought:

According to student opinions on the distance education process,

1. What is the level of students' home infrastructure, online interactions, informatics skills, academic satisfaction, and academic performance?
2. Is there a significant relationship between students' academic performance and their home infrastructure, online interactions, informatics skills, academic satisfaction?
3. Do home infrastructure, online interactions, informatics skills, and academic satisfaction significantly predict students' academic performance?

METHOD

The research is a correlational study designed in the descriptive model. The research aims to examine the changes affecting the perceptions of academic performance of higher education students. The dependent variable of this study is the perceptions of academic performance of higher education students in the distance education process. The independent variables of the research are home infrastructure, online interaction, computer skills, and perceptions of satisfaction.

Workgroup

This research is based on a large-scale study examining the pandemic's impact on higher education student perceptions in 2020. This research, "The impact of the Covid-19 pandemic on the lives of higher education students", has been applied worldwide. The research was prepared for all higher education students over 18. However, since it is aimed at students who can be reached through social media aged 18 and over around the world, the simple random sampling method has been preferred. The study was responded to by 10092 high school students from 130 countries. In the current study, 1049 Turkish students who participated in the study were included in the study group, and the data on the participants were presented in Table 1.

Table 1. Participant data

Variable		N	%
Level of education	License	902	86
	Master	110	11
	Doctor	31	3
Field	Arts and humanities	29	20
	Social sciences	699	68
	Applied sciences	95	9.3
	Nature and life sciences	23	2.2
Gender	Male	298	28
	Female	743	71
	Preferred not to say	6	.06
Total		1049	100

Data collection tools

As a data collection tool, the online scale applied within the scope of the research titled "The impact of the Covid-19 pandemic on the lives of higher education students" was used. The scales were developed using the European Students' Union. The scale, which contains 39 items, was initially prepared in English. Later, it was adapted into Italian, Northern Macedonian, Portuguese, Roman, Spanish, and Turkish. Linguists carried out the adaptation process in the relevant languages who have a high level of proficiency in English. The data set of the study was first analyzed by Aristovnik, Kerži˘c, Ravšelj, Tomaževi˘c & Umek (2020). Within the scope of the current research, home infrastructure, online interaction, computer skills, satisfaction perceptions, and academic performance perception scales were used. Scales are five-point Likert where 5 represents the highest and 1 represents the lowest.

Home infrastructure

It contains provisions for the equipment students need to be involved in the distance education process. In addition, it contains items related to access to the computer, the necessary software, programs. Scale reliability is reported as .89 by calculating Omega (Aristovnik, et a., 2020). In this research, reliability analyses of the scales were calculated as .84 Cronbach alpha.

Online interaction

The scale consists of 3 items regarding the interaction of students with friends, faculty, and administrators. The scale's reliability is .72.3 Omega (Aristovnik, et a., 2020). As part of the current research, reliability analyses of the scales were replicated and calculated as .66 Cronbach alpha. According to Kılıç (2019), .60 to .70 is acceptable. The low number of scale items can cause this condition.

Computer skills

The scale consists of 5 items related to the student's access to online information and their use of online communication platforms. The reliability of the scale was reported as .913 Omega (Aristovnik, et a., 2020). As part of the current research, reliability analyses of the scales were replicated and calculated as .91 Cronbach alpha.

Perceived student satisfaction

It includes the perceptions of students in the distance education process. It expresses satisfaction with online courses, faculty members, consultancy services provided. Scale reliability was reported as .852 Omega (Aristovnik, et a., 2020). As part of the current research, reliability analyses of the scales were replicated and calculated .80 Cronbach alpha.

Perceived student performance

The scale consists of 4 items, including sentences like *I have improved my performance and adapted to new learning teaching techniques.* The reliability of the scale is .845 Omega (Aristovnik, et a., 2020). In this research, it was calculated.81 Cronbach alpha.

All participants read an informative confirmation page about the purpose and details of the research prior to the research. Before the scale is implemented, it passes to the scale items by approving the information page. This study is in line with the Helsinki Declaration for human participants. Ethical permissions have been obtained from various higher education institutions for the research (Yozgat Bozok University, no:31/21).

Data analysis

This research was carried out in 2020 with Turkish higher education students who participated in the research titled "The impact of the Covid-19 pandemic on the lives of higher education students" implemented worldwide. It is aimed to examine the variables affecting the perceptions of academic performance of higher education students. The predictive effects of home infrastructure, online interaction, computer skills, and academic satisfaction perception variables on higher education students' academic performance perceptions in the distance education process were examined. Before the analysis, missing data and extreme values were determined. Mahalanobis distances were compared with the critical chi-square value ($p<.001$). 12 scales were excluded, and the analysis was conducted with 1037 scales. Skewness and kurtosis values were examined to control the normal distribution of the data. It was determined that the skewness and kurtosis values of the variables were within the acceptance limits (Tabachnick & Fidell, 2013).

To investigate the multicollinearity problem VIF and tolerance values were examined. In the current research, the VIF value of home infrastructure, online interaction, computer skills, satisfaction perception and academic performance perception variables (1.338; 1.052; 1.421; 1.080; 1.206 respectively) and tolerance values (.747; .950; .704; .926; .829 respectively) were found to be in the acceptance range. It was also found that the intervariate correlations were positive but valued below.80 and did not show multicollinarity spelling problems (Table 3).

During the analysis phase, the data were examined using descriptive statistics. In addition, hierarchical multiple regression analysis was used for intervariate relationships, Pearson correlation analysis, and determining predictors of academic performance perceptions. In the first step, the predictive value of home infrastructure on the perception of academic performance was examined. In the second step, home infrastructure was kept as a control variable. Finally, the predictive value of computing skills, online interaction, and satisfaction perception on the perception of academic performance were examined. A packaged program (SPSS) was used in the analysis of the data.

RESULTS

This section presents findings on the relationships between home infrastructure, online interaction, computer skills, and perceptions of satisfaction and academic performance according to higher education student opinions during the distance education process. In Table 2, descriptive analysis results of higher education student opinions are presented.

Table 2. *Descriptive analysis results of higher education student views*

	N	Average	Sd	Skewness	Curtosis
1. Home infrastructure	1037	3,75	1,20	-.628	-.794
2. Computer skills	1037	3,76	.87	.506	-.062
3. Perceived satisfaction	1037	2,98	.41	-.736	.595
4. Online interaction	1037	2,24	.92	-.133	-.216
5.Perception of academic performance	1037	2.83	.93	.025	-.525

As can be viewed from Table 2, home infrastructure, in other words, having the necessary equipment for distance education in the distance education process ($\tilde{x}$ =3.75) and computer skills ($\tilde{x}$ =3.76) had a higher average than other variables. On the other hand, the lowest average was determined on the scale of online interaction ($\tilde{x}$ =2.24). In Table 3, correlation analysis results of variables are presented.

Table 3. Correlation analysis results of variables

Factors	1	2	3	4	5
1. Home infrastructure	1				
2. Computer skills	.492**	1			
3. Perceived satisfaction	.173**	.180**	1		
4. Online interaction	.075*	.116**	.086**	1	
5. Perception of academic performance	.228**	.331**	.232**	.216**	1

*p<.05; **p<.01

As can be viewed from Table 3, home infrastructure had a positive, *moderate* and significant relationship with computer skills (r=.492; p<. 01). This finding reveals that students who have computer access at home define themselves “better” in computer skills. It was found that computer skills had positive *moderate* significant relation with the perceived academic performance,

(r=.331; p<. 01), which underlines the relationship between students' perception of being academically successful and having computer skills in the distance education process. As seen in Table 3, there are significant low-level positive relations between other variables. Table 4 presents hierarchical multiple regression analysis results

Table 4. Hierarchical multiple regression analysis results

Variables	**R**	**R^2**	**ΔR^2**	**B**	**Standard Error**	β	**t**
Step 1							
Home infrastructure	.228	.052	.052	.117	.023	.228	7.542*
Step 2							
Computer skills	.414	.171	.119	.269	.035	.250	7.611*
Perceived satisfaction				.360	.065	.161	5.563*
Online interaction				.170	.029	.168	5.865*

R=. 414; $R2$=.171; F= 53,261; p=.000
Dependent variable: academic performance perception

When the data in table 4 are examined, it is seen that the home infrastructure variable in the first step is a significant predictor of academic performance perception (R=.228, R^2=.05, ΔR^2=.05). In the second step of the analysis, when home infrastructure is kept under control, it was determined that computer skills, perceived satisfaction, and online interaction variables were significantly predictive on the perception of academic performance (R=.414, R^2=.17, ΔR^2=.119). According to standardized regression coefficients *(β),* the importance order of variables in explaining the academic performance perception is listed as computer skills (β=.250), online interaction (β=.168), and perceived satisfaction (β=.161). The fact that the variables in the second step of the analysis the explained variance increased (ΔR^2=.119) revealed that the variables of computer skills, online interaction, and satisfaction perception contribute to academic performance. As a result, home infrastructure, computer skills, online interactions, and students' academic satisfaction in the distance education process explain 17% of academic performance perceptions.

DISCUSSION, RESULTS AND RECOMMENDATIONS

Within the scope of this study, which aims to examine the relationship between the perceptions of academic performance of higher education students and their home infrastructure, computer skills, online interactions, and perceptions of academic satisfaction, firstly the levels of variables according to student opinions were examined. It was determined that home infrastructure and computer skills variables had the highest average among the variables. In parallel with the developing technology since the 1990s, young people have become the most intensive users of various communication and information technologies (Sağır & Eraslan, 2019). In addition, in the 21st century, smartphones have become a symbol for young people to reflect "identity and style/style" (Ling, 2004). According to the results of the Turkish Statistical Institute's (TUIK) Household Information Technology Usage Survey, 92.0% of households will have access to the internet from home in 2021; It was revealed that 80.5% of all individuals aged 16-74 used the internet regularly (almost every day or at least once a week) during the period covering the first three months of 2021 (TUIK, 2021). Today, the age of having a phone has decreased to the level of primary education. Therefore, in today's technology age, it is understandable that home infrastructure is high. In addition, the higher average of computer skills may be explained by the adaptation of children and young adults to the developing technology.

Satisfaction perception, perception of academic performance, and online interaction are averaged below mid-level ($\tilde{x}$ =3). Among the variables, the lowest average is in the online interaction variable. Education is a process based on mutual interaction. However, due to the pandemic, interaction was limited to online platforms. Being away from traditional face-to-face interaction opportunities and being limited to certain communication technologies have made the teaching-learning process difficult. It was more difficult especially in areas that require application. Even before pandemic conditions, the report by Industry Expansion Solutions (2015) revealed that in distance education, academic and social relations decreases. It is difficult to develop relationships with classmates, there is limited personalized attention from instructor and there is no campus atmosphere to create social interaction. Similarly, Nambiar (2020) found that instructor-student interaction decreased during the distance education process.

Within the scope of the second question of the study, the relationships between variables were examined. It was observed that there was a significant positive relationship between all variables and academic performance perception. The highest relationship was determined between computer skills and academic performance perception. This finding suggests that students who have acquired the skills to access information and know-how to research, perceive themselves as more successful. The distance education process requires students to have high self-regulation and self-control skills. They need to take more responsibility in their learning process. They have to be aware of their individual knowledge needs and skills and improve themselves constantly. In other words, they need to be conscious information consumers as Eryılmaz (2018) defines them. In this direction, students' competence and skills in every respect, especially in computers, allow students to participate in courses actively and do the assignments better. The research of Wu et al. (2010), which noted ineffective computer skills as an essential factor that hinders the effective distance education process, supports that. Similarly, Ezziane (2007) states computer literacy is one of the most important skills for individuals to possess in today's competitive environment. It can be stated that students with knowledge and experience in digital media are more easily adapted to distance learning.

The other variable positively related to students' perception of academic performance is home infrastructure. In the distance education process, students who have equipment such as computers, necessary software, cameras, and microphones have a higher perception of academic performance. Having the necessary equipment is a prerequisite for using computer skills at home. Therefore, it can be stated that the relationship between academic performance perception and home infrastructure is parallel to the relationship between academic performance and computer skills. Dinçer (2011) stated that the use of technological tools in the distance education process has become such a prerequisite for access to information that development is possible with computer literacy.

Within the framework of the current research, it has been determined that students' online interaction positively affects their perception of academic performance. Therefore, faculty members play an active role in executing educational processes. Within the scope of distance education, when an interaction is reduced, faculty members must guide students and provide timely feedback besides instruction of course contents. Because one of the main problems raised about the distance education process is the decrease in interaction (Nambiar, 2020), therefore, increasing interaction can also be effective in increasing the perception of academic performance.

Another variable positively related to the perception of academic performance is academic satisfaction. Students with higher satisfaction with the learning process expressed a more favorable opinion of their academic performance. In other words, students who feel academically satisfied in the distance education process perform better. The relationship between academic satisfaction and performance in literature is noted in the face-to-face education process (Dhaqane & Afraf, 2021) and the distance education process (Kerzˇič, Alex, Pamela Balbontı's Alvarado, Bezerra Dd, Cheraghi, Dobrowolska, et al, 2021).

The positive relationship between all variables reveals that all variables in the education system are interconnected. Therefore, to achieve the desired outputs, all variables must be processed effectively at the same time. As a result, students' having the necessary equipment increases their computer skills, and the students with good computer skills also achieve higher satisfaction with the process and perform better academically with a higher level of interaction.

Finally, the study's findings on the prediction of academic performance perceptions of higher education students were obtained. It has been observed that home infrastructure has a significant impact on the student's academic performance. During distance education, technological equipment and connection have become the only means of connecting students with the educational environment and teachers. It has been not possible for the students who do not have the necessary materials and connection opportunities to be involved in the education process. Therefore, it may be concluded that the infrastructure increases the interaction of the student, which increase their performance. This finding is consistent with other research results associated with the distance learning process (Wu et al., 2010).

Thanks to smartphones, nearly all higher education students have the necessary material to participate in the course. In addition, in Turkey, students who do not have the opportunity to access have been designated by the university rectorates, and necessary initiatives have been made to make use of the facilities in the public institutions in the city where the students live. Considering these conditions, home infrastructure is taken as a control variable and the effects of computer skills, perceived academic satisfaction, and online interaction on academic performance are examined. As a result of this review, students' computer skills are the highest predictor of their perception of academic performance, followed by their online interactions and, finally, perceived satisfaction. In the 21st century, information technology literacy has become a key competence in recognizing the information needed and making the necessary research for it. Students are no longer expected to memorize information, but to access information through information technologies, to analyze and use the information they need. In this direction, the importance of computer skills in the education process has increased. Especially in the distance education process, computer skills have an indispensable role.

This study is limited to Turkish Higher Education students who participated in the research titled "The impact of the Covid-19 pandemic on the lives of higher education students". This result may not reflect the overall view of higher education students in Turkey. Reconducting the study in certain regions of Turkey and handling it on the basis of different universities may produce significant results. Also, investigation of the relationships with different variables will contribute to the field. Today, pandemic conditions are still ongoing. In addition, even as the pandemic ends, online education has become an indispensable part of our education system. The study revealed that s students' computer skills increase, their sociability on the internet and their communication with their teachers increase. This significant relation consequently influences their satisfaction and academic performance. Considering these situations, it is useful to evaluate the results of the current study, carrying out studies for students to gain computer skills should be a priority in educational planning.

Ethics Committee Approval: Ethics committee approval was received for this study from Yozgat Bozok University, Decision number: 21/31, Date: 21.03.2022.

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