Research Article

Factor Analysis of the Effects of Education Systems During the Covid-19 Pandemic Process on Manisa Celal Bayar University Students

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Abstract

This study aims to examine the opinions and thoughts of students studying at Manisa Celal Bayar University Faculty of Economics and Administrative Sciences in the 2022-2023 academic year regarding distance and face-to-face education systems during and after the Covid-19 pandemic process, by factor analysis. The findings obtained as a result of the factor analysis were examined and interpretations were made. The data used in the study was collected by survey technique. Analyses were carried out using the SPSS-22 statistical package program and results were obtained using explanatory factor analysis, one of the multivariate statistical techniques. The number of students who will participate in the survey was determined by taking into account their departments using the stratified sampling technique, provided that they took courses with the distance education model during the Covid-19 pandemic and continued their education with the face-to-face education model after the pandemic. In this way, 342 of the 4518 students studying at the faculty were determined as the sample and the study was conducted with 342 students who fully responded to the survey. The findings obtained as a result of the explanatory factor analysis applied. Accordingly, it has been observed that the effects of the Covid-19 pandemic process and subsequent education systems on students are explained by two factors. The first of these two factors is named "Positive Effects of Face-to-Face Education" and the second is called "Negative Effects of Face-to-Face Education". These named factors explain 69% of the total variance.

Keywords Covid-19, Factor Analysis, Explanatory Factor Analysis, Undergraduate Education, Face-to-Face Education, Distance Education

Jel Codes I18, C38, I21

Contents

1. Introduction

In the current study, it is aimed to examine the opinions and thoughts of students attending the Faculty of Economics and Administrative Sciences of Manisa Celal Bayar University during the 2022-2023 academic year on the Covid-19 pandemic process and the subsequent remote and face-to-face education systems by using a factor analysis. The findings obtained as a result of the factor analysis were examined and interpreted. The data used in the study were collected by using the questionnaire technique. The analyses were performed using the SPSS-22 statistical program package and the results were obtained by using an explanatory factor analysis, one of the multivariate statistical techniques. The number of the students who would participate in the questionnaire was determined by using the stratified sampling technique. The inclusion criteria used in the selection of the students was that their, having taken courses through distance education during the Covid-19 pandemic and continued their education face-to-face after the pandemic. In this way, 342 of the 4518 students studying at the faculty were determined as a sample and the study was conducted with 342 students who fully responded to the questionnaire.

Covid-19 emerged in China's Wuhan province in December 2019, then spread all over the world and was recognized as a pandemic by the World Health Organization (WHO) in March 2020 (WHO, 2020a). In this coronavirus, which is accepted to be a pandemic, a condition that cannot be treated and shows symptoms similar to pneumonia has been experienced by people who have come into contact with the virus (Aslan, 2020; Xu et al., 2020). The disease caused by this virus was first named as 2019 Novel Coronavirus and later as Covid-19 (WHO, 2020b). Research has shown that this virus can cause pneumonia in severe cases and may require artificial respiration. It is important for those who have mild symptoms to rest at home, take fever-reducing measures and consume fluids. Especially people with chronic conditions such as diabetes, high blood pressure, lung disease, heart disease and the elderly are at risk. In addition to the elderly, children and young people can also become infected and spread the disease around them. Serious progression of the disease can also be observed in children and adolescents (T.C. Sağlık Bakanlığı, 2020).

Covid-19 Pandemic and Education in The Pandemic

Education is of great importance in terms of the formation of personality traits such as desire for self-actualization, love and respect (Tekke, 2019). Educational systems have been affected by various epidemics throughout the human history. The Covid-19 pandemic has caused quite large effects on health, social life, economy and education after it appeared in China on December 1, 2019. On March 11, 2020, the World Health Organization declared it a global pandemic (Can, 2020). As a result, it was decided to close schools in 191 countries and thus 1,724,657,870 students were affected by this situation (Işık & Bahat, 2021). All over the world, countries tried to reduce the negative effects in the field of education with different practices during this period when more than one billion students were away from face-to-face education. Continuity of education was ensured through distance education instead of face-to-face education (Özer & Suna, 2020). During the Covid-19 pandemic, the disease was more seen in young people, so they had to be more careful and thus they were exposed to social isolation with more precautions (Üstün & Özçiftçi, 2020). Quarantines caused emotions such as anxiety, fear, frustration, hopelessness and anger in students. This process was more risky for people who had mental problems and whose treatment was ongoing (Boelen & Spuij, 2013). After the closure of schools due to the Covid-19 epidemic, some countries decided that it would be safe to

reopen schools when the required conditions were met. Reasons for reopening varied but in general included the need to increase student knowledge and skills, compensate for learning losses, and provide additional services. Other reasons that might have affected the decision to reopen schools included new findings showing how students could contribute to the spread of infection (OECD, 2020).

2. Materials and Method

2.1. Factor Analysis

Factor analysis is a mathematical model that tries to explain a large set of variables through a small number of variables using factors. An important assumption of factor analysis is that it is possible to observe these factors directly. The factors are also subject to random errors. Such an assumption is especially suitable for disciplines such as psychology. It is necessary to define the subject of interest in order to fully measure it, but it is often unclear how to define some concepts, such as intelligence (Mardia et al., 1995). It is a type of method that helps explain the model explained by p interrelated variables with a smaller number of new factors ($k < p$) that have correlations within themselves but no correlation between them (Alpar, 2011). Theer are two types of factor analysis; explanatory factor analysis and confirmatory factor analysis. The aim of an explanatory factor analysis is to reduce the number of variables and to make the interpretation of the obtained factors by naming them. In other words, as a result of an explanatory factor analysis the variables collected under the factor are tested for their suitability to the theoretical structure. The purpose of a confirmatory factor analysis is to test the accuracy of the structure with the data obtained from the scale developed with this theoretical structure. In a factor analysis, KMO (Kaiser-Meyer-Olkin) test statistical results are used to test the extent to which the structure of the data fits the number of observations. This test compares the magnitude of the observed correlation coefficient with the magnitude of the partial correlation coefficient (Büyüköztürk et al., 2016).

2.2. Types of Factor Analysis

Factor analysis, which is a multivariate statistical analysis, has different names for the way it is applied and for the purpose of application.

Q-type factor analysis is an analysis performed by using the correlation matrix of the n unit whose P variable is being investigated. By investigating the parity of units, it tries to decipher a small number of homogeneous subgroups from the parities between the units. By transposing the X-very matrix, the R matrix is found. It is aimed to determine k-dimensional factors for n units (Özdamar, 2002).

The process of obtaining different dimensions by drawing on the correlations between variables is called R-type factor analysis. This type of analysis is the most widely used one. As an example, if the goal in a data matrix with a number of 50 observations and 10 properties is to understand whether there is factorization in the variables we are considering or to summarize the variables, correlation coefficients between the variables are used and examined. When factor analysis is considered, the analysis method that usually comes to mind first is "Explanatory Factor Analysis". It is similar to R-type factor analysis. The X data matrix is a factor analysis application that takes advantage of variable relationships and aims to identify a smaller number of independent new factors (Bereket Çilingir, 2019).

In a confirmatory factor analysis method, the structure and factors found among the variables have been created in advance with their basic outlines and are known by the researcher. Even if the relationship matrix is used, the analysis result or factor distributions do not change. In short, the purpose of a confirmatory factor analysis is to verify the existence of a known relationship (Sharma, 1996).

3. Literature Review

The literature review regarding the study is shown in Table 1 below (İşseven, 2023).

Table 1. Literature Review

Author	Method	Program	Result
Teke (2023)	Frequency analysis, analysis of descriptive statistics, reliability and validity analysis, normality test and Pearson correlation analysis	SPSS 24	Ahorsu et al. (2022) Covid-19 fear scale, House & Rizzo (1972) job stress scale and Using the Hackman & Oldham (1975) job satisfaction scale, a survey form was administered to 285 people working in the branches of a private bank in Denizli. It was determined that the scale has a single factor, there is a significant positive relationship between fear of Covid-19 and job stress, and a significant negative relationship between fear of Covid-19 and job satisfaction.
Kanat Aydın (2022)	Confirmatory factor analysis and explanatory factor analysis	SPSS 26 AMOS 24	It was aimed to investigate the relationship between concerns about the Covid-19 epidemic and parental burnout. As a result, parental burnout has increased due to economic insecurity during the Covid-19 epidemic. It has been observed that functional social media use softens this relationship. It has been observed that the functional use of social media does not have a regulatory effect on interpersonal relations in people whose fear and anger are easily conveyed in the digital environment.
Zorlutuna & Erilli (2021)	Independent t-test, ANOVA, Scheffe test, chi-square test	SPSS 22	It was aimed to determine the perspectives of Sivas Cumhuriyet University Faculty of Economics and Administrative Sciences students on the distance education system during the Covid-19 pandemic period, their self-efficacy regarding the distance education system, and their opinions on courses conducted via distance education. According to the analysis results, it was concluded that 31.8% of the students preferred distance education and 42.4% preferred face-to-face education. In terms of understanding the lessons, 49.6% of the students are thought to be better in face-to-face education and 40.2% in distance education.
Çelik (2021)	Independent sample t-test, one-way analysis of variance, multiple regression analysis, simple correlation analysis and multiple correlation analysis	SPSS 22	It was aimed to investigate the psychological impact of the Covid-19 pandemic process on the graduate student sample living in Turkey and to understand the impact of other sociodemographic factors on this process. Based on self-report in recruitment, Sarı et al. (2016) Patient Health Survey-9 and Konkan et al. (2013) Generalized Anxiety Disorder-7 scales were used. As a result of the examination of the findings, it was found that 44.3% of the students included in the study had anxiety disorder, 70.5% had depressive disorder, and 42.0% had both anxiety disorder and depressive disorder.
Şenel (2021)	Factor analysis, correlation and regression analysis	SPSS 22	It was aimed to determine the effect of remote working, which became popular during the epidemic, on performance and whether the fear of catching Covid-19 played an intervening variable in this. In line with the analysis results, it has been

Author	Method	Program	Result
			observed that all four dimensions of remote working have a positive effect on performances, and two dimensions of remote working have a significant effect on the fear of catching Covid-19. It has been observed that the fear of catching Covid-19 does not have a significant effect on performance. For this reason, it was concluded that the fear of catching Covid-19 did not play an intervening variable role in the regression analysis conducted for the mediation effect. As another result, the fear of catching Covid-19 is mostly seen in women.
Karadeniz (2021)	One-way analysis of variance, student's t-test, regression analysis, factor analysis and Pearson correlation test	SPSS 22	It was aimed to investigate the effect of the Covid-19 epidemic on the anxiety levels that may occur in individuals according to their existing sociodemographic characteristics. As a result of the analysis, it was found that there was a significant and strong positive relationship between the participants' state and anxiety scores in some subgroups according to their sociodemographic characteristics. As with other epidemic diseases, the Covid-19 process has caused anxiety in people and revealed the need to strengthen public health against such epidemic situations.

4. Application

In the letter titled "Investigation of the Effects of Education Systems on Students During and After the Covid-19 Pandemic by Using Factor Analysis" submitted by Merve İşseven, a master's student at the Department of Econometrics of the Institute of Social Sciences of Manisa Celal Bayar University, dated 05.01.2023 with the subject of Aynur İNCEKIRIK-Your Application to the Ethics Committee-Hk, numbered E–050.01.04-461351, Reference: dated 21.12.2022 and numbered 452339, the ethical conformity of the thesis study was decided by the Scientific Research and Publication Ethics Committee of the Social and Human Sciences of Manisa Celal Bayar University Presidency, dated 30.12.2022 and numbered issue 2022/11.

4.1. Purpose of the Study

One of the biggest effects of the Covid-19 pandemic, which has affected many areas of our lives, has been on the educational process at universities. The aim of this study is to determine the factors affecting the opinions and thoughts of students attending the Faculty of Economics and Administrative Sciences at Manisa Celal Bayar University during the 2022-2023 academic year about the Covid-19 process and subsequent educational systems.

4.2. Data Collection Tools

The questions in the questionnaire form prepared in accordance with the purpose of the study were inspired by the questionnaire scale developed by Zorlutuna & Erilli (2021) and used in the study entitled "Approaches of Students of the Faculty of Economics and Administrative Sciences to Distance Education during the Covid-19 Pandemic". The questionnaire form consists of two parts. In the first part, there is a section where the demographic information of the participants is elicited. In the second part, there are questions to elicit information to serve the purpose of the study. In this study, all the rules that must be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were complied with. Ethics committee permission dated 30.12.2022 and numbered 2022/11 was obtained from Manisa Celal Bayar University Social

and Humanities Scientific Research and Publication Ethics Committee for the study. The data of the study were collected after the necessary permission was obtained.

4.3. Sample and Population

The sample of the study consists of 342 students selected on the basis of departments by using the stratified sampling method from a total of 4518 students attending the Faculty of Economics and Administrative Sciences of Manisa Celal Bayar University during the 2022-2023 academic year. In terms of ease of data transfer to Excel, the questionnaire form was organized using the Google Forms platform and administered to the participants through the face-to-face questionnaire method. The participants who would be included in the sample or who would not be included in the sample were determined according to some criteria given below.

Inclusion criteria:
- ‣ The participants should be students during this period,
- ‣ They must have taken courses with the distance education model during the Covid-19 pandemic.

4.4. Data Analysis

The answers given to the questionnaire form throughout the study were transferred to the SPSS-22 statistical program package for analysis. In the analyses, the significance level was taken as $p < 0.05$. In the analysis of the data obtained from the first part of the questionnaire form frequencies and percentages were used. Before starting the analysis, a normality test was performed by examining missing data and outliers. Validity and reliability analyses were performed for the scale used in the study. In this direction, descriptive statistics, reliability and validity analyses, normality test and explanatory factor analysis were used in the analysis of the collected data.

4.5. Findings and Evaluations

In this part of the study, the findings obtained from the data are presented together with their evaluations.

4.5.1. Demographic Information

Information was collected about the gender, age, type of education, grade level, department, accommodation, monthly income and family of the participants. This information is presented in Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, Table 8 and Table 9. Of the participants, 62.9% are female and 37.1% are male. The majority of the participants (59.9%) are between the ages of 21 and 23, 19.20% are in the 18-20 age group, 15.2% are in the 24-26 age group and 5.3% are in the 27 and older age group. Of the participants, 12% have been at university for one year, 13.7% for two years, 45% for three years, 20.5% for four years, 6.7% for five years and 2% for 6 years or longer. The departments attended by the participants were selected by the stratified sampling method and have a balanced distribution. More of the participating students live in Manisa (57%) compared to those living outside the city and 37.7% of the participants live with their families, 32.5% live in a state dormitory, 16.4% live in rented houses/flats, 7.9% live in a private dormitory, 4.1% live with their relatives/acquaintances and 1.5% live in a guesthouse. Finally, 29.2% of the participants have families with an income of 15001 and above, 18.4% have families with an income between 6001 and 9000, 16.4% have families with an income between 9001 and 12000, 13.5% have families with an income between 12001 and 15000, 11.7% have families with an income between 3501 and 6000 and 10.8% have families with an income between 0 and 3500.

Table 2. Gender Distribution of Participants

Gender	Number of People	%
Female	215	62,9
Male	127	37,1
Total	342	100,0

Table 3. Age Distribution of Participants

Age	Number of People	%
18-20	67	19,6
21-23	205	59,9
24-26	52	15,2
27 and above	18	5,3
Total	342	100,0

Table 4. Education Type Distribution of Participants

Education type	Number of People	%
Formal education	241	70,5
Secondary education	101	29,5
Total	342	100,0

Table 5. Distribution of Years Spent by Participants at University

Years	Number of People	%
1 Year	41	12,0
2 Year	47	13,7
3 Year	154	45,0
4 Year	70	20,5
5 Year	23	6,7
6 Year and above	7	2,0
Total	342	100,0

Table 6. Distribution of Departments Studying by Participants

Departments	Number of People	%
Business Administration	89	26,0
Department of Economics	63	18,4
Finance Department	70	20,5
Public Administration	37	10,8
Social Sciences and International Relations	31	9,1
Labor Economics	29	8,5
Econometrics	23	6,7
Total	342	100,0

Table 7. Province Distribution of Participants' Residence

Residences	Number of People	%
Manisa Province	195	57,0
Out of province	147	43,0
Total	342	100,0

Table 8. Distribution of Participants' Housing Preferences

Housing Preferences	Number of People	%
Homestay	129	37,7
State Dormitory	111	32,5
Private Dormitory	27	7,9
Tenement	56	16,4
Relatives/acquaintances	14	4,1
Guesthouse	5	1,5
Total	342	100,0

Table 9. Monthly Income Distribution of Participants' Families

Monthly Income	Number of People	%
0-3500	37	10,8
3501-6000	40	11,7
6001-9000	63	18,4
9001-12000	56	16,4
12001-15000	46	13,5
15001 and above	100	29,2
Total	342	100,0

4.5.2. Explanatory Factor Analysis

The suitability of the data for factor analysis can be checked by using Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett sphericity test. The KMO value to be considered sufficient for a factor analysis should be higher than 60% (Uğurlu, 2013). Field classifies a value between 0.80 and 0.90 as "excellent" (Field, 2009). The KMO value given in Table 10 was obtained as 0.961, and it is seen that the sample has an "excellent" suitability for factor analysis. Bartlett Sphericity test value was found to be 6213. 124 and significance level was found to be ($0.00 < 0.01$); thus, it was concluded that the correlations between the variables are significant for factor analysis. Thus, it is seen that the sample adequacy is appropriate for factor analysis.

Table 10. KMO and Bartlett Test Statistics

KMO and Bartlett's Test		
KMO Sampling Adequacy		0.961
Bartlett Sphericity Test	Chi-Square	6213.124
	df	190
	Sig.	0.000

The total explained variance values are given in Table 11. In the first column of this table, there are components as many as the items. In the column containing the initial eigenvalues, the total eigenvalue, the percentage of contribution to variance and the cumulative percentage of contribution to variance are included in terms of the contribution of each factor to the total variance. Another column, the" Sum of Derived Squared Weights", contains values in order to determine the number of factors. When the derived squared weights column of the table is examined, it is seen that the smallest eigenvalue is 2.546. In this direction, since 2 factors with eigenvalues greater than 1 have been obtained, a two-factor structure is proposed for explanatory factor analysis. The total variance explained by the first factor is 56.808%. The total variance explained by the second factor is 12.73%. The contribution of these two factors to the total variance is seen as 69.538%.

Table 11. Total Explained Variance Table

Factor	Initial Eigenvalues			Sum of Derived Squared Weights			Sum of Rotated Squared Weights
	Total	% Variance	Cumulative%	Total	% Variance	Cumulative%	Total
1	11.362	56.808	56808	11.362	56.808	56.808	10.966
2	2.546	12.730	69538	2.546	12.730	69.538	6.311
3	0.865	4.324	73.862	-	-	-	-
4	0.649	3.246	77.108	-	-	-	-
5	0.562	2.810	79.918	-	-	-	-
6	0.476	2.379	82.297	-	-	-	-
7	0.400	2.002	84.299	-	-	-	-
8	0.377	1.887	86.186	-	-	-	-
9	0.353	1.764	87.950	-	-	-	-
10	0.330	1.648	89.599	-	-	-	-
11	0.306	1.530	91.128	-	-	-	-
12	0.274	1.372	92.501	-	-	-	-

There are different techniques for determining the number of factors to be rotated. One of them is the evaluation of the scree plot. In the scree plot, the number of factors is determined through the detection of the high momentum fall (Saraçlı, 2011). Each interval between two points represents a factor. As can be seen from Figure 1 shown below, there is a high momentum fall after the second factor. Thus, it was decided to reduce the number of factors to two factors.

The common variance (Communality) table shows the variance values that each variable shares with the other variables included in the analysis (Hair et al., 1998). In this table, variables with values below 0.50 are excluded from the analysis as long as deemed necessary and the analysis is performed again. In this way, the variance values explained and the KMO test value will increase. But on the contrary, if the values are above 1, there may be two reasons for this. These reasons are the determination of fewer or more factors than should be determined in the analysis, or the data set is insufficient. The following Table 12 shows the common variance values obtained from the final version of the analyses performed. According to this table, the 23rd item has the highest common variance value (I waste my time coming and going to school for face-to-face education) and its value is 0.838. That means 23rd item is the item has an 83% commonality in the variance. The reason why

all the initial eigenvalues in the table are 1.000 is that the basic components analysis assumes all variances as common.
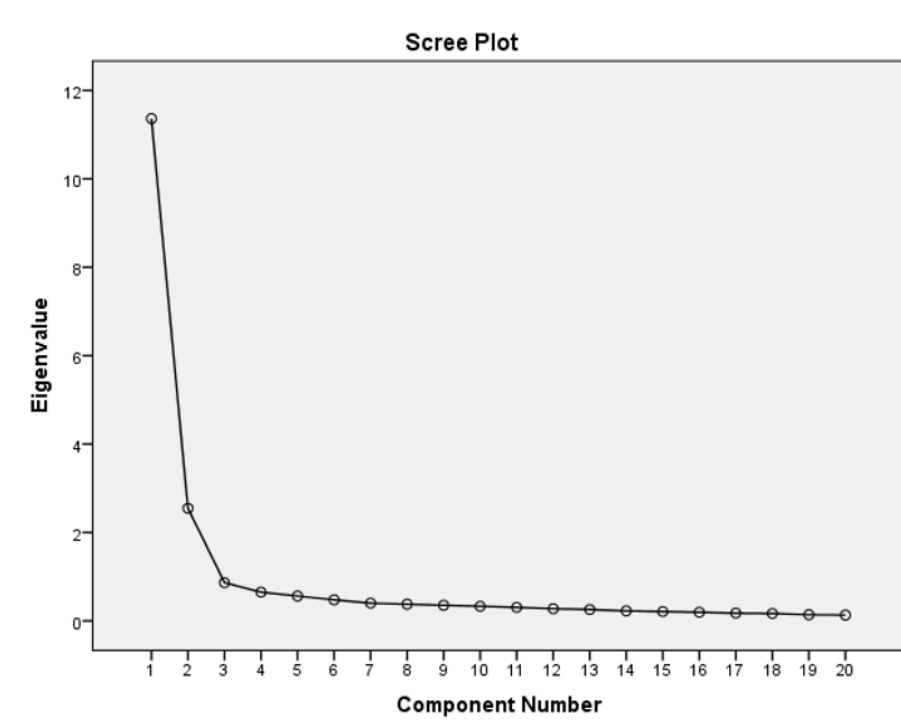

Figure 1. Scree Plot

Table 12. Common Variance Table

Question	Initial Eigenvalue	Common Variance Value
Q20. I have difficulties in reaching school during face-to-face education. (Being late, lack of bus services)	1.000	0.706
Q21. Seasonal changes in face-to-face education affect my participation in class.	1.000	0.748
Q22. Transportation to school is quite expensive in face-to-face education.	1.000	0.797
Q23. With face-to-face education, I lose time traveling to and from school.	1.000	0.838
Q1. I understand and learn the lesson better when taught face to face.	1.000	0.740
Q3. My course grades increased with face-to-face education.	1.000	0.722
Q4. Face-to-face education ensures that learning lessons is permanent.	1.000	0.774
Q5. With face-to-face education, I can give my full attention to the lessons.	1.000	0.789
Q6. I feel more comfortable in face-to-face classes.	1.000	0.736
Q7. I do not have difficulty expressing my thoughts in face-to-face education classes.	1.000	0.713
Q14. I feel more comfortable during exams in face-to-face education.	1.000	0.568
Q17. I prefer face-to-face education to distance education.	1.000	0.753
Q19. In face-to-face education, the exams pass smoothly since there are no systemic and hardware problems (computer-related) in online exams.	1.000	0.482
Q24. Face-to-face education generally requires more expenses (accommodation, social needs, transportation, etc.).	1.000	0.698
Q25. I can reach faculty members more easily in face-to-face education.	1.000	0.672
Q26. Face-to-face education has a positive impact on my social relations.	1.000	0.693

Question	Initial Eigenvalue	Common Variance Value
Q27. It feels good for me to get away from the home environment thanks to face-to-face education.	1.000	0.690
Q28. With face-to-face education, the lack of working space has been eliminated. (Library etc.)	1.000	0.658
Q29. The events held at my university (seminars, interviews, festivals, graduation ceremonies, etc.) affect me positively.	1.000	0.624
Q15. I do not miss classes during face-to-face education.	1.000	0.496

Direct Oblimin method was used since it was assumed that the factors were related to each other during the rotation phase.

The Promax method is known as one of the indirect rotation methods because it affects the results obtained from other rotation methods. The Direct Oblimin method, on the other hand, converts factor rotation directly into the final solution. The Direct Oblimin method refers to the rotation family, although it is considered a rotation method by some researchers. Each Direct Oblimin rotation is described by its delta value, which indicates how closely related the factors may be. If the calculated delta value is zero, the related and unrelated factors are weighted equally and this is called Quartimine rotation (Karaman, 2023).

The rotated components matrix includes the separation of each variable according to factors. The purpose here is to remove values that have no loading value, values that are below the accepted value of 0.32, and crossloading items from the analysis, and repeat the same process until there are no problematic items left. An crossloading item is present in more than one factor at a time and the difference between these values is less than 0.1. In line with this definition, items 2, 8, 9, 10, 11, 12, 13, 16, 18 were removed from the analysis in order to avoid any problems. Table 13 below contains the rotated factor matrices. In this table, there are two factors and the weights of the variables of each factor. It is clearly seen that the items that are semantically related to each other are included under the same factor. In the first factor, the item 1 "I understand and learn the lesson taught face to face better" has the highest weight. In the second factor, the highest weight belongs to the item 23 "I waste my time coming and going to school for face-to-face education."

Factor 1 consists of 15 items. These are; item 1 "I understand and learn the lesson taught face to face better", item 3 "There was an increase in my course grades with face-to-face education", item 4 "Face-to-face education ensures that the learning of lessons is permanent", item 5 "With face-to-face education, I can give all my attention to the lessons", item 6 "I feel more comfortable in face-to-face lessons", item 7 "I have no difficulty expressing my thoughts in face-to-face education classes", item 14 "I feel more comfortable in face-to-face education exams", item 15 " I do not play truant in face-to-face education", item 17 "I prefer face-to-face education to distance education", item 19 "In face-to-face education, exams are taken more easily because there are no system and hardware related problems", item 25 "I can reach the teaching staff more easily in face-to-face education", item 26 "Face-to-face education has a positive impact on my social relations", item 27 "It feels good for me to get away from the home environment to attend face-to-face education", item 28 "With face-to-face education, finding a place to study is easier (Library, etc.)" and item 29 "Events organized at my university (seminars, interviews, festivals, graduation ceremony, etc.) positively affect me". It is

seen that these items reflect students' positive attitudes towards and thoughts about face-to-face education. Therefore, this factor is called the "Positive effects of the face-to-face education model".

Factor 2 consists of 5 items. These are; item 20 "I experience difficulties in reaching school in face-to-face education (transportation problem)", item 21 "Weather conditions affect my attendance in face-to-face education", item 22 In face-to-face education, transportation to school is quite expensive.", item 23" With face-to-face education, I waste my time coming and going to school" and item 24 "Face-to-face education is generally more expensive (housing, social needs, road, etc.)". Thus, this factor is called the "Negative effects of the face-to-face education model".

Table 13. Rotated Factor Matrices

Question	Factor 1	Factor 2
Q1. I understand and learn the lesson better when taught face to face.	0.901	
Q5. With face-to-face education, I can give my full attention to the lessons.	0.88	
Q26. Face-to-face education has a positive impact on my social relations.	0.858	
Q27. It feels good for me to get away from the home environment thanks to face-to-face education.	0.856	
Q3. My course grades increased with face-to-face education.	0.838	
Q4. Face-to-face education ensures that learning lessons is permanent.	0.835	
Q28. With face-to-face education, the lack of working space has been eliminated. (Library etc.)	0.834	
Q29. The events held at my university (seminars, interviews, festivals, graduation ceremonies, etc.) affect me positively.	0.819	
Q6. I feel more comfortable in face-to-face classes.	0.816	
Q7. I do not have difficulty expressing my thoughts in face-to-face education classes.	0.814	
Q25. I can reach faculty members more easily in face-to-face education.	0.806	
Q17. I prefer face-to-face education to distance education.	0.766	
Q19. In face-to-face education, the exams pass smoothly since there are no systemic and hardware problems (computer-related) in online exams.	0.734	
Q14. I feel more comfortable during exams in face-to-face education.	0.679	
Q15. I do not miss classes during face-to-face education.	0.667	
Q23. With face-to-face education, I lose time traveling to and from school.		0.915
Q22. Transportation to school is quite expensive in face-to-face education.		0.895
Q24. Face-to-face education generally requires more expenses (accommodation, social needs, transportation, etc.).		0.859
Q20. I have difficulties in reaching school during face-to-face education. (Being late, lack of bus services)		0.834
Q21. Seasonal changes in face-to-face education affect my participation in class.		0.798

When we look at the correlations in Table 14 below, it is seen that there is a medium, and negative correlation between Factor 1 and Factor 2. The items in Factor 1 have positive effects on students while the items in Factor 2 have negative effects on them.

Table 14. Correlation Relationship Table

	Factor 1	Factor 2
Factor 1	1.000	−0,478
Factor 2	−0,478	1.000

4.5.3. Cronbach's Alpha Reliability Analysis

After factor analysis was applied, reliability analysis was performed separately for all articles and for each factor. The minimum accepted value in reliability analyses is considered as 0.60.

Table 15. Reliability Analysis of All Items

Cronbach's alpha	N
0.870	20

Table 16. Reliability Analysis of Factor 1

Cronbach's alpha	N
0.964	15

Table 17. Reliability Analysis of Factor 2

Cronbach's alpha	N
0.920	5

In Table 15 given above, it is seen that the reliability of 20 items is at a sufficient level with a ratio of 0.870. The reliability level of the factor named "Positive effects of the face-to-face education model (Factor 1)" in Table 16 is quite sufficient with 0.964. The reliability level of the factor named "Negative effects of the face-to-face education model (Factor 2)" in Table 17 is quite sufficient with 0.920.

5. Conclusion and Suggestions

The purpose of the current study is to determine the factors affecting the opinions and thoughts of students attending the Faculty of Economics and Administrative Sciences at Manisa Celal Bayar University during the 2022-2023 academic year about the Covid-19 pandemic and subsequent educational systems. For this purpose, a questionnaire was administered to 342 students selected by means of the stratified sampling method from a total of 4518 students attending different departments of the faculty. Factor analysis, which is one of the multivariate statistical methods, was applied to the data obtained from the questionnaire. An explanatory factor analysis was performed using the SPSS-22 program package. The questionnaire form used in the study consists of two parts. There are 8 demographic questions in the first part and 29 items in the second part.

The reliability test result of these 29 questions was found to be 0.82 at the significance level of 0.05. Since this value obtained is between 0.80 and 1.00, it can be said that the questionnaire form is reliable. Kaiser-Meyer Olkin test was applied to test the suitability of the sample size for factor analysis in the study. As a result of the test, it was found that the KMO sample adequacy value was obtained as 96.1% and was quite high for explanatory factor analysis. Here, the Bartlett test value was found to be statistically significant with a result of $p < 0.05$. In order to obtain the factor pattern of the scale, basic components analysis was preferred from factorization techniques. Since it is assumed that the factors are related to each other, it has been seen that the Direct Oblique rotation method, one of the oblique rotation methods, is suitable. Here, the items that are connected to each other or do not have a load value should be removed from the analysis one by one, respectively, and the analysis should be performed again every time. In this way, items 2, 8, 9, 10, 11, 12, 13, 16, and 18 were excluded from the analysis as they cross loaded. The number of variables was reduced from

29 to 20, and as a result of the analysis performed using these 20 variables, it was decided that the number of factors should be two.

These two factors explain 69.54% of the total variance. The first factor is named as" Positive effects of face-to-face education model "and the second factor is named as" Negative effects of face-to-face education model". The contribution of the first factor to the total variance is much higher than that of the first factor. When the items in the first factor are examined, it is understood that students prefer face-to-face education more than distance education. When they attend face-to-face education, according to students, their grades increase, they understand lessons better, they can pay more attention to the lesson, their learning is more permanent, they feel more comfortable in classes and exams, and they take exams more easily because they do not have computer-related problems in exams, they do not have difficulty expressing their thoughts, they feel psychologically good because they are away from the home environment, and at the same time their social relationships are positively affected due to the events organized at the university, they have no difficulty in finding a place to study and that they can reach the teaching staff more easily.

The variables in the second factor are related to negative effects of face-to-face education. These items indicate that students do not prefer face-to-face education because they waste their time coming and going to school transportation to school is quite expensive, they need to find a place to stay and weather conditions may affect their attendance. In face-to-face education, students' transportation problems can be solved by increasing the number of public transportation services. Moreover, demographic variables have also some effects on students' opinions. In this regard, it can be said that students coming to school from outside Manisa province and students living in a dormitory view the distance education model more positively. Of the participating students, 27 live in private dormitories and 111 in state dormitories. More public dormitories can be built to reduce the expenses of students. The number of students staying with their families is 129. Due to the Covid19 pandemic, at the time the questionnaire was completed, anxiety about transmitting the virus to family members was observed in these students. In addition, when the attitudes and behaviours of all the students participating in the study were examined, it was found that they had a fear of being infected with the virus. In addition, it was determined that there were 56 people staying in a rented house, 14 people staying with relatives or acquaintances, and 5 people staying in a guesthouse. In addition, the sample of the study, Manisa Celal Bayar University Faculty of Economics and Administrative Sciences students, are still taking some elective courses with the distance education model.

When the results obtained were evaluated, it was determined that the students participating in the study could easily participate in live lessons taught in the virtual environment with the distance education model from wherever they were. However, in this model, students said that they could not pay full attention to the lesson and could not learn the lessons permanently. It is thought that the problems experienced by students in classes will be resolved thanks to the face-to-face education model. At the same time, it is clear that with the face-to-face education model, the exams will be taken more easily as students will not experience computer-related technical problems during the exams. The face-to-face education model had a positive impact on socialization for students in the family home during the Covid-19 pandemic. However, it has been determined that the distance education model has many positive aspects in terms of financial and comfort for students. With this study, students' attitudes and behaviours about education models during and after the pandemic were determined and some insights were obtained about the education model they preferred. It

is thought that this study will contribute to the literature in terms of examining similar pandemic processes that may occur and the effects of post-pandemic education systems on students. In addition, it is thought that for future studies, including other units of Manisa Celal Bayar University as well as different universities, increasing the size of samples, and including different classes and departments in the study will make the studies on the subject stronger. It may also be recommended to conduct comparative studies between the units of this university and between different universities.

Declarations

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