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Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi
Malatya Turgut Özal University Journal of Business and Management Sciences
ISSN: 2717-7890
Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

APA Style Citation View:

Macit, A., Özden, M.A. & Yavaş, V. (2023). Digital and Innovative Transformation in Vocational Aviation Education: An Application on Expectations of Aviation Businesses. *Malatya Turgut Özal University Journal of Business and Management Sciences,* 4(2), 123-142.

DIGITAL AND INNOVATIVE TRANSFORMATION IN VOCATIONAL AVIATION EDUCATION: AN APPLICATION ON EXPECTATIONS OF AVIATION BUSINESSES*

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ABSTRACT

The aviation industry is inherently one of the sectors that use technology and digitalization at the highest level. Over the years, digital training methods have been used in various professional specializations to meet the needs of qualified personnel in the aviation sector. Pilotage and Air Traffic Controllers, which have rigorous standards and qualification expectations, are examples. However, vocational aviation education is not limited to these aspects. Aviation management-based professions, such as ground services, airline services, and airport services, which can be expressed within the social sciences, are also in high demand. Concurrently, many institutions in these fields operate at pre-higher and higher education levels. Unfortunately, students in this field who will be trained in the aviation sector with a high technological infrastructure are educated with a traditional and non-technological education curriculum. This creates a deficiency in the quality of graduates. When the aviation businesses employs personnel of this quality, they must undergo a re-training process. In this study, a simulation was performed based on passenger services to eliminate this gap. Free demo software was developed in accordance with the software currently used in the passenger service sector, and students were trained using this software. The students' theoretical training prior to utilizing the software was evaluated, then their opinions after the software training were re-evaluated, and a comparison was made. It was revealed that applying this method to passenger services contributed significantly to students' learning levels.

Keywords: Vocational Education, Passenger Services, Digitalization, Aviation Business

JEL Codes: I23, L86, O32, R49

MESLEKİ HAVACILIK EĞİTİMİNDE DİJİTAL VE YENİLİKÇİ DÖNÜŞÜM: HAVACILIK İŞLETMELERİNİN BEKLENTİLERİ ÜZERİNE BİR UYGULAMA

ÖZ

Havacılık sektörü doğası gereği teknolojiyi ve dijitalleşmeyi en üst düzeyde kullanan sektörlerden biridir. Yıllar içinde havacılık sektöründe nitelikli personel ihtiyacını karşılamak üzere çeşitli mesleki uzmanlık alanlarında dijital eğitim yöntemleri kullanılmaya başlanmıştır. Sıkı standartlara ve yeterlilik beklentilerine sahip olan Pilotaj ve Hava Trafik Kontrolörlüğü bunlara örnektir. Ancak mesleki havacılık eğitimi bu alanlarla sınırlı değildir. Sosyal bilimler içerisinde ifade edilebilecek yer hizmetleri, havayolu

* Araştırma Makalesi, (Research Article), Gönderilme Tarihi (Received): 21.08.2023, Kabul Tarihi (Accepted): 27.09.2023, iThenticate Benzerlik Oranı: %4, Bu çalışma Ege Üniversitesi Bilimsel Araştırma Projeleri Koordinatörlüğü tarafından onaylanarak yürütülen bir çalışmanın sonuçlarını içermektedir. Makale sonunda proje numarası belirtilmiştir.
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ISSN: 2717-7890
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hizmetleri ve havaalanı hizmetleri gibi havacılık yönetimine dayalı meslekler de yüksek talep görmektedir. Aynı zamanda bu alanlarda birçok kurum önlisans ve yükseköğretim düzeyinde faaliyet göstermektedir. Teknolojik altyapısı yüksek olan havacılık sektöründe yetişecek bu alandaki öğrenciler ne yazık ki geleneksel ve teknolojiden uzak bir eğitim müfredatı ile yetiştirilmektedir. Bu da mezunların kalitesinde bir eksiklik yaratmaktadır. Havacılık işletmeleri bu nitelikteki personeli istihdam ettiğinde yeniden bir eğitim sürecinden geçmesi gerekmektedir. Bu çalışmada bu açığı gidermek için yolcu hizmetleri temel alınarak bir simülasyon gerçekleştirilmiştir. Yolcu hizmetleri sektöründe hâlihazırda kullanılan yazılımlara uygun olarak ücretsiz bir demo yazılımı geliştirilmiş ve öğrencilere bu yazılım kullanılarak eğitim verilmiştir. Öğrencilerin yazılımı kullanmadan önceki teorik eğitimleri değerlendirilmiş, ardından yazılım eğitiminden sonraki görüşleri tekrar değerlendirilmiş ve bir karşılaştırma yapılmıştır. Bu yöntemin yolcu hizmetlerine uygulanmasının öğrencilerin öğrenme düzeylerine önemli katkı sağladığı ortaya çıkmıştır.

Anahtar Kelimeler: Mesleki Eğitim, Yolcu Hizmetleri, Dijitalleşme, Havacılık İşletmeleri

JEL Kodları: I23, L86, O32, R49

1. INTRODUCTION

The transportation sector is one of the most indispensable building blocks of modern life. People intensively use various modes of transportation according to their economic and cultural characteristics, both in their daily lives and travel plans. Among these modes of transportation, it is seen that the interest in airline transportation has increased significantly in recent years.

The aviation sector has rapidly become widespread in many countries and regions owing to factors such as increasing accessibility for all consumers or, in other words, passengers, providing ticket prices that can compete with other modes of transportation, and standing out with high safety and prestige. This supply provided by the stakeholders in the aviation sector has been reciprocated by the passengers and has become the demand and has become the primary transportation mode of choice for many people due to the factors such as speed, safety and comfort it provides.

With this increasing interest in the aviation sector, many businesses that operate directly or indirectly with the aviation sector, such as airline management, ground handling services, airport and terminal management, and hotel and tourism management, have become employment gates for people in order to meet the demand throughout the sector. In 2019, the year before the Covid-19 period when the aviation sector peaked, approximately 88 million people were employed in aviation and related fields worldwide, of which approximately 11 million were directly related to aviation (ATAG, 2023). In parallel with this situation worldwide, in Turkey, approximately 300,000 people were employed in the aviation sector as of 2019, while this number has decreased by 10% due to the effects of Covid-19 (DGCA, 2022).

Along with this high employment rate in the aviation sector, the attractiveness of the sector also affects young people, and the aviation sector is at the forefront of many career plans. In parallel with this, there has been an increasing number of high school- and higher-education-level aviation training institutions in Turkey in recent years. In these institutions, the number of departments/programs such as pilotage, air traffic controllers, aircraft technicians, and cabin services, where technical education and application opportunities are high, as well as departments/programs such as civil air transportation and aviation management, where theoretical education is dominant, is quite high. Students, who are candidate employees of the aviation sector who receive education in these departments/programs, graduate with a very large percentage or complete theoretical education until they reach the graduation stage.

The aviation sector has infrastructure that carries out its activities and workflow processes through various digital systems. However, in many departments and programs in high schools and higher education institutions, theoretical education is still conducted using traditional methods. This difference between academia and the sector creates a bottleneck in terms of training qualified students and meeting the sector's needs. For this reason, it is very important to create innovative

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transformations in education processes by considering sectoral dynamics in relevant educational institutions.

In this study, a software that will be used to gain the necessary competencies in line with the need for a qualified workforce in the aviation sector, which is an important area of the service sector, and in the light of today's digital developments, was realized, and it was aimed at increasing the competencies of the students. In this sense, a software has been developed for check-in systems, which are frequently used in passenger services/guest services departments, providing the most intense employment opportunities at the beginning of the sector, and is aimed at providing students with a qualification needed in the sector before entering the sector. Check-in systems can be expressed as a process that manages the admission of passengers to flight, and many businesses in the sector use various check-in programs with different infrastructures but similar structures. The software program developed and used in this study aims to develop training material that can be used in the training of all faculties, colleges, vocational schools, and even aviation high schools providing aviation education in Turkey, rather than targeting a specific institution or organization, thus prioritizing the digitalization of aviation education. The uniqueness of the subject of this study stems from the fact that there is currently no software program that is used for educational purposes and meets the needs of the sector. Although there are various software programs used in the sector and various training programs for them, it is thought that the high cost of these training programs and the elements of legal liability are far from being a sustainable solution for educational institutions. It is assumed that the check-in system developed and used in this study can have high accessibility and provide a simple and effective benefit to overcome the lack of practical training in the field of aviation.

This study will continue with a literature review of related fields. In the methodology section, details about the developed check-in software are shared, as well as information about the implementation to measure the effects of the system on students' learning levels. In the Discussion and Conclusion sections, the results of the application and future expectations are discussed.

2. LITERATURE REVIEW

There are various studies on the impact of digitalization and digital elements on vocational education. In a study suggesting that vocational education today is designed on the axis of Industry 3.0, and continues with this philosophy, the importance of updating education and training activities on the axis of Industry 4.0, that is, in accordance with digitalization, is mentioned (Masrifah and Sudira, 2020). In another study that suggested the positive impact of digital elements on vocational education and training activities, digitalization has an important contribution in terms of complementing traditional elements in educational institutions and its benefits for students and graduates to complete their induction and acclimatization processes quickly and efficiently (Busse et al., 2019). In a study conducted in the USA and Singapore, it was stated that the use of digital elements in educational processes contributes to the competitiveness of students by adding value, not only theoretically but also practically (Innokentievich et al., 2021).

While a general evaluation is made in studies on the importance of digitalization in vocational education, the number of studies examining the transformation of the field of aviation is quite limited. It can be said that this deficiency encountered in academic studies on the aviation sector is similar in general terms for many sectors. However, it can be said that digitalization, adaptation to the sector and gaining competence in vocational education are more important than education and training activities in basic sciences. In this sense, increasing the number of studies on digital transformation in vocational education and increasing the number of similar examples in the field of aviation is very important in terms of contributing to the literature. With digital and innovative transformations in education, a natural transformation can be experienced in traditional education methods that focus on theoretical education and lack practice. Theoretical education-oriented

Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

approaches in vocational education for various reasons are one of the major risks for the future of the sector in terms of training qualified students.

Although families have a high share of the choice of vocational aviation education in Turkey, prospective students consciously prefer these departments/programs in line with their career goals (Şen, 2019). However, it is a matter of debate whether these departments/programs, which students prefer in line with their career goals, have an educational quality or competence that meets the demands and needs of students and, of course, the sector. Although university-industry collaborations are elements that provide added value in the aviation sector, as in many other sectors, stakeholders in the sector try to eliminate this problem with training or courses within their own organizations with the idea that university students from related fields may be insufficient in terms of competence (Durmuş and Tokyay, 2021). In this case, the importance of university-industry coordination rather than university-industry cooperation emerges. Training curricula that will be created or updated by evaluating the expectations of the vocational aviation education sector can provide greater convenience in terms of both the development of candidate students and the training of graduates in line with the expectations of professionals in the sector (Yalçınkaya and Adiloğlu, 2012).

In a study on employment and career in aviation, one of the possible reasons why graduates face dissatisfaction in their professional lives is that they do not graduate with sufficient knowledge about the job they will do during their education period, and they do not gain sufficient awareness about the nature of their jobs (Kiracı and Bayrak, 2014). This should be considered another factor that shows the importance of practical training in related departments. In another study on vocational aviation education, it was revealed that students doing internship in the sector need more than the knowledge they have acquired in higher education institutions, and this situation is a reflection of the theoretical dominant education in the curricula of the relevant institutions (Yavaş et al., 2021). On the other hand, in addition to the formal departments related to aviation, the number of departments/programs offering education and training activities through distance education is also increasing. In these programs, which are carried out through open or distance education methods, students may not even have internship opportunities, let alone practical training. In a study conducted in this sense, a person who has been in the sector for many years emphasized that the education curricula of the relevant departments/programs, although sufficient in theoretical terms, does not have a sufficient equivalent in terms of sectoral practice (Durali and Özdamar, 2021).

Although a lack of practical training seems to be predominantly experienced in higher education institutions, similar problems are also observed in vocational aviation schools, the number of which is rapidly increasing at the high school level. In a 2019 study conducted in the context of aviation high schools, the lack of applied training and expert trainers in the relevant field are prominent findings (Somuncu, 2019).

In general terms, the lack of applied training is more prominent in departments/programs other than those for licensed personnel (pilotage, air traffic, aircraft technicians, etc.) in vocational aviation education. Compensating for deficiencies in practical training due to various sectoral constraints with digital elements will be an important opportunity in terms of vocational education in aviation. For this reason, it is believed that a digital and innovative transformation or various applications to be made in education curricula will make a great contribution to increasing the quality of education and thus to raising qualified graduates.

The use of rapidly developing technology at various levels in all economies has brought about a mandatory transformation in vocational education. In this sense, it is important that students in the vocational education system be reinforced with various digital tools, software, and applications during the education process in order to have the competencies expected by the relevant sectors, especially digital literacy (Kovalchuk et al., 2023). For example, studies have shown that the use of virtual reality as a pedagogical tool in vocational education at an earlier

Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

level reveals that students can learn vocational education with immersive, interactive, more realistic, more embedded knowledge, and higher motivation (Ravichandran and Mahapatra, 2023).

Although aviation and space technology are sectors with a high level of development, the quality of vocational education is still traditional. In parallel with this progress in the aviation and space sector, it is important to ensure and maintain this progress in vocational education in the relevant field. Digital learning process methods have been applied in various aviation fields, mainly in technical fields, and these applications facilitate learning processes (Hendrarini, 2020). The necessity of digital transformation in education curricula is undoubtedly important, but at this point, it is also important to transform the infrastructure. For example, in the digital transformation process, in addition to infrastructural elements such as smart classrooms and strong Internet connections, arrangements should be made to eliminate the sectoral and digital deficiencies of instructors (Sergeieva et al., 2021). In a case study on digitalization in aviation education, it is stated that the digitization and tracking of aviation and flight-related documents stand out with their contribution to the pedagogical development of students as well as accurate and timely access to the necessary information (Shamsiev, 2021).

While learning is a lifelong activity for almost all aviation professionals, it is emphasized that a generation that learns with digital elements in vocational education can gain competence that adds value to lifelong learning processes with changes in learning habits and innovation (učo et al. 2020). In this sense, improving the qualifications of students by using digital elements, especially in vocational education processes, will not only contribute to students at the graduation stage but will also add value by providing skills in the long term.

This study aims to measure the contribution of methods supported by digital and innovative elements in the vocational education processes of students receiving vocational aviation education to their learning levels. In this sense, a simulation of digital check-in programs, which are frequently used in the field of passenger/guest services, was prepared and transferred to students. The learning level between traditional theoretical education and education methods supported by digital elements was investigated. Details of this method are provided in the next section of the study.

3. METHOD

Within the scope of this study, a digital check-in training program was created to learn about airport passenger service processes. This program is capable of performing the chek-in and boarding processes of a flight, and a series of operations are necessary to perform these processes. The program competencies are in line with theoretical passenger services. For this reason, this study aims to reveal the effect of the digital program on the passenger service learning process by measuring the passenger service knowledge of students through program competencies. In this context, eight sections and 45 questions were prepared for the operations that can be performed in the program, and data were collected as a pre-test and post-test on a 5-point Likert scale. Determined questions were asked to 67 people who had received theoretical training related to passenger services and their opinions were asked to determine whether they knew the relevant processes. Afterwards, for 14 weeks, these people were given program training and were shown how to perform the procedures. The same questions were then asked to the same people again, and whether they knew the processes related to the transactions was measured. By comparing the Pre-Test and Post-Test data with statistical methods, the support of the digital program for the theoretical knowledge of passenger services was attempted. However, the study was carried out with a limited sample from the same person and institution. The inability to measure the impact of different programs, different people and institutions constitutes the limitations of the study.

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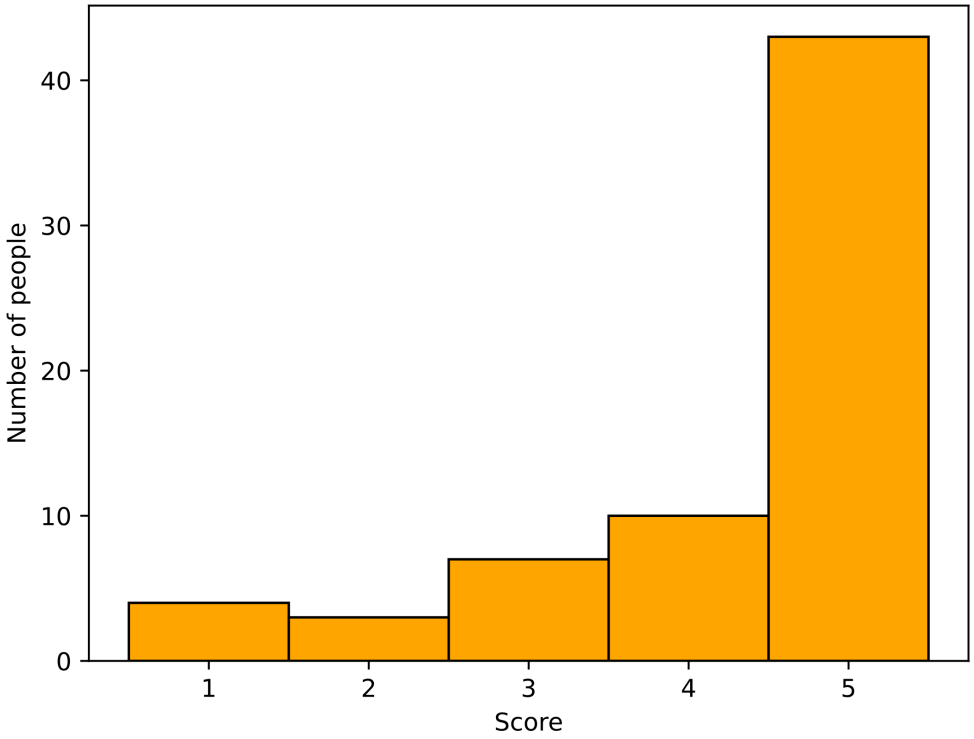

Figure 1: Histogram of Answers to The Question 1 in Pre-Test

At the beginning of the study, it was considered to use paired t-test for comparing the data obtained from two tests. However, upon examining the dataset, it was determined that the data does not follow a normal distribution. Therefore, it is believed that the results of comparison methods based on t-distribution, which evaluate based on the mean value, may not be reliable. Thus, addition to the paired t test, non-parametric tests such as Mann-Whitney U (Mann & Whitney, 1947) test and Wilcoxon signed rank test (Wilcoxon, 1945) which are more suitable to evulate ordial data are performed to compare results. In Figure 1 answers to question 1 in pre-test given as an example and it is clearly evident that the data do not conform to a normal distribution.

4. RESULTS

The survey consisted of 8 sections and 45 questions. Same survey performed on the same students before and after the learning process with the developed computer program. In each group, questions that touched on the issues that needed to be known about the work competence determined were prepared. In each group, the number of questions differed according to the amount of work.

P-values were calculated for each test, and their significance was evaluated by determining whether the p-value is less than 0.05. If the p-value is less than 0.05, the null hypothesis is rejected, and it is accepted that the two data sets are different. The p-values greater than 0.05 are indicated in bold fonts. The precision is 4 digits, therefore the values less then 5e-5 are considered as 0.0000.

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Table 1: Results of part 1

		Pre-Test		Post Test		P Values		
Q. No.	**Question**	**Mean**	**Median**	**Mean**	**Median**	**Paired T**	**Mann-Whitney U**	**Wilcoxon**
Q1	I know what this process is needed for	4.2687	5	4.5373	5	**0.0978**	**0.2091**	**0.1210**
Q2	I know what information is required to create a flight	3.2985	3	4.4776	5	0.0000	0.0000	0.0000
Q3	I know what the systemic setbacks are when the relevant information is missing	2.9552	3	4.2537	5	0.0000	0.0000	0.0000

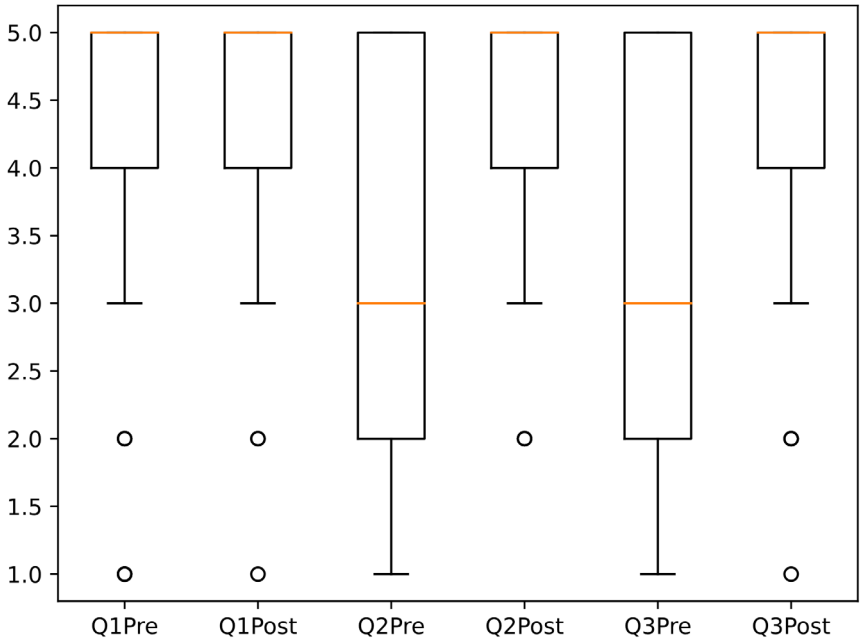

Figure 1: Results of part 1

Part 1 consists of the process of creating flights. In Table 1 and Figure 1, results of the section 1 are given. Except for the question 1, there is a significant difference for all questions and an increase was observed in both the mean and median values.

When the results are evaluated, although it can be learned with the theoretical training what the flight creation process is before the program, it can be concluded that the practical skills and information about what is required to create a flight and what the problems to be experienced systematically are learned through the digital program and the information is reinforced.

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Table 2: Results of part 2

		Pre Test		Post Test		P Values		
Q. No.	**Questions**	**Mean**	**Median**	**Mean**	**Median**	**T**	**Mann-Whitney U**	**Wilcoxon**
Q4	I know what PNL means	4.4328	5	4.6716	5	**0.1281**	**0.1428**	**0.1484**
Q5	I know the purpose of PNL	3.6567	4	4.6567	5	0.0000	0.0000	0.0000
Q6	I know how to create a PNL	1.8955	1	4.0448	4	0.0000	0.0000	0.0000
Q7	I know what the systemic setbacks are when there are deficiencies in the PNL	2.5821	2	4.3433	5	0.0000	0.0000	0.0000
Q8	I know how to correct PNL deficiencies	1.6567	1	3.9403	4	0.0000	0.0000	0.0000

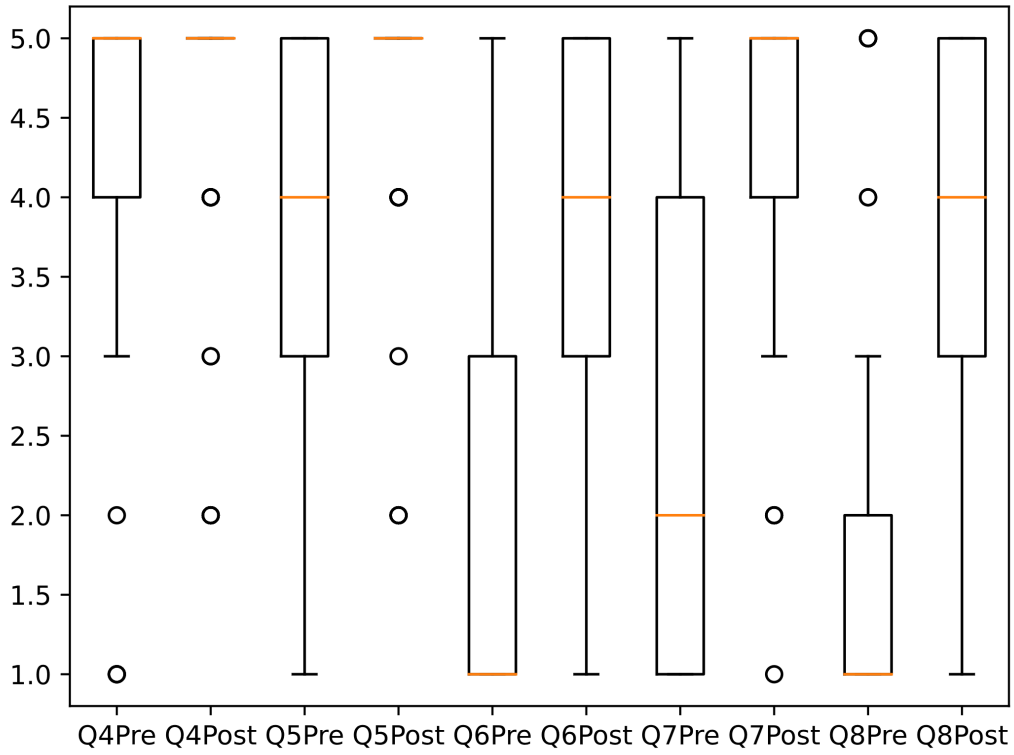

Figure 2: Results of part 2

Part 2 covers the procedures for identifying passenger names and information in the system, called Passenger Name List (PNL). In Table 2 and Figure 3, results of the section 2 are given There were five questions in the PNL group. Except for the question 4, there is a significant difference for all questions and an increase was observed in both the mean and median values. The pre-test average of the question "I know the purpose of PNL" was 3.66, and the average of the post-test was 4.66.

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For question "I know how to create a PNL," the pretest average is 1.90, and the final test average is 4.04. This shows that knowledge increased significantly with education. The average of the question "I know what the systemic disruptions are when there are deficiencies in the PNL" increased from 2.58 to 4.34. The question that showed the biggest difference between the averages in this section was "I know how to correct PNL deficiencies." The average was 1.66 in the preliminary test and 3.94 in the final test. This means that how education can address PNL deficiencies makes a significant difference to learning.

When the results are evaluated, although it is known what PNL means before the training, it can be concluded that the important deficiencies related to the procedures to be performed are eliminated after the digital program training. In addition, it can be said that the program for problems that may be experienced with PNL improves existing knowledge.

Table 2: Results of part 3

		Pre Test		Post Test		P Values		
Q. No.	**Questions**	**Mean**	**Median**	**Mean**	**Median**	**T**	**Mann-Whitney U**	**Wilcoxon**
Q9	I know how to look for passengers in the PNL list	2.3582	2	4.4179	5	0.0000	0.0000	0.0000
Q10	I know the constraints I can use in the search for passengers	2.1940	1	4.3433	5	0.0000	0.0000	0.0000
Q11	I can understand the explanations and information about special circumstances related to passenger	3.1194	3	4.5970	5	0.0000	0.0000	0.0000
Q12	I am able to make seat selection for the passenger whom I am authorized to perform	2.5075	2	4.6567	5	0.0000	0.0000	0.0000
Q13	I can evaluate the Seat Chart	1.9702	1	4.1194	5	0.0000	0.0000	0.0000
Q14	I can ensure that I allocated a seat for the passenger	2.2239	1	4.5224	5	0.0000	0.0000	0.0000

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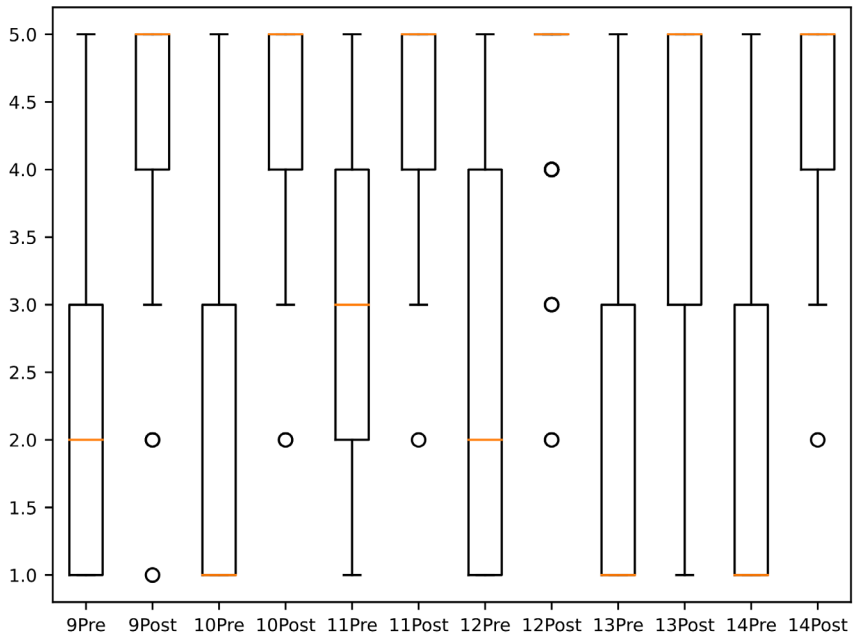

Figure 3: Results of part 3

Part 3 covers questions related to Passenger Search and Seat Allocation procedures, which are the beginning of the check-in process. In Table 3 and Figure 4, results of the section 3 are given. There were six questions related to passenger search and seat allocation in the group. As a result of statistical tests, a significant difference was found between the pre-test and the final test in the six questions. In this context, when the averages are examined, the average of the question "I know how to look for passengers on the PNL list" increased from 2.36 in the preliminary test to 4.42 in the final test. The average increased from 2.19 to 4.34 for the question "I know the constraints I can use in passenger searching" and from 3.12 to 4.60 for the question " I can understand the explanations and information about special circumstances related to passenger ". From this, it can be concluded that there is pre-training information about special situations, and that the program has contributed to this. It was seen that the average increased from 2.51 to 4.66 for the question " I am able to make seat selection for the passenger whom I am authorized to perform" from 1.97 to 4.12 for the question "I can make a Seat Chart evaluation," and from 2.22 to 4.52 for the question " I can ensure that I allocated a seat for the passenger".

When the results are evaluated; in passenger search and seat allocation processes, it can be said that digital program training contributes significantly to learning the process. In addition, it can be said that a significant difference appears in all questions, but the difference between the averages is more in some questions and less in some questions, and that the program increases the knowledge of the existing information and creates a reinforcing effect in short.

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Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi
Malatya Turgut Özal University Journal of Business and Management Sciences
ISSN: 2717-7890
Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

Table 3: Results of part 4.

		Pre Test		Post Test		P Values		
Q. No.	**Questions**	**Mean**	**Median**	**Mean**	**Median**	**T**	**Mann-Whitney U**	**Wilcoxon**
Q15	I know the baggage procedures that the passenger will carry with them	4.0000	5	4.6567	5	0.0005	0.0011	0.0006
Q16	I know the information to be entered about baggage when creating a baggage check	3.1642	3	4.5672	5	0.0000	0.0000	0.0000
Q17	I know how to create a luggage tag	3.1343	3	4.5821	5	0.0000	0.0000	0.0000
Q18	I know the special cases of baggage	3.2985	3	4.2836	5	0.0001	0.0002	0.0003
Q19	I know how to enter data as a description of baggage exceptions	1.9552	1	4.0000	4	0.0000	0.0000	0.0000
Q20	I know the importance of the luggage tag number	3.8508	5	4.7164	5	0.0000	0.0006	0.0000

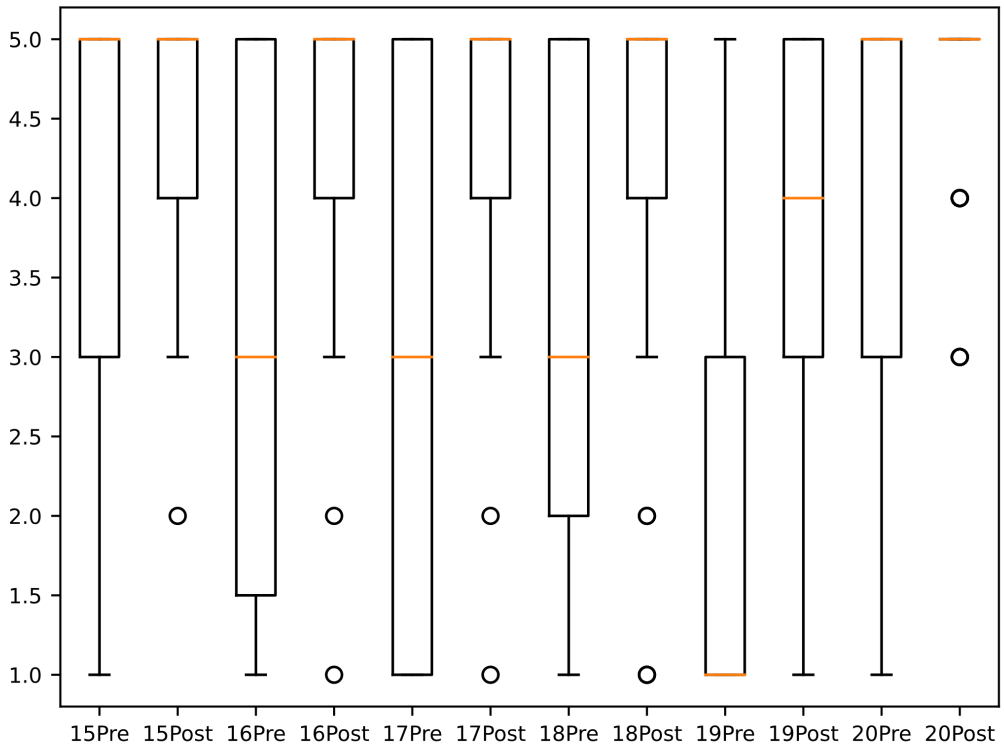

Figure 4: Results of part 4.

Part 4 covered questions related to baggage handling, which is an important element of the check-in process. In Table 4 and Figure 5, results of the section 4 are given. This section contains six questions on baggage handling. When the statistical results examined, a significant difference was found between the pre-test and the final test for the six questions. Considering the question averages in this regard; It was observed that the average for the question " I know the baggage

MTU - JBMS
Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi
Malatya Turgut Özal University Journal of Business and Management Sciences
ISSN: 2717-7890
Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

procedures that the passenger will carry with them" increased from 4.00 to 4.66, the question "I know the information to be entered about the baggage when creating the baggage record" increased from 3.16 to 4.57, the question "I know how to create a baggage tag" increased from 3.13 to 4.58, the question "I know the baggage situations with special circumstances" increased from 3.30 to 4.28, and the average of the question "I know the importance of the baggage tag number" increased from 3.85 to 4.72. This rise shows that the knowledge obtained as a result of theoretical training is at a significant level and that the digital program has an effect on reinforcing knowledge. In this group, the question "I know how to enter data as an explanation of baggage special situations" increased significantly, from an average of 1.96 to 4.00. This situation proves that there is a lack of knowledge in theoretical education on this subject and that this deficiency is eliminated with the digital program.

When the results were evaluated in the group where theoretical training on baggage procedures created important knowledge, it was concluded that digital program training increased the level of knowledge and, at the same time, some of the missing information could be closed by the program.

Table 5: Results of part 5.

		Pre Test		Post Test		P Values		
Q. No.	**Questions**	**Mean**	**Median**	**Mean**	**Median**	**T**	**Mann-Whitney U**	**Wilcoxon**
Q21	I know the importance of APIS Registration	2.6866	2	4.2537	5	0.0000	0.0000	0.0000
Q22	I know the information required in APIS Registration	2.0299	1	4.0896	4	0.0000	0.0000	0.0000
Q23	I know the areas I need to check for a visa	4.1045	5	4.6716	5	0.0021	0.0226	0.0021
Q24	I know what information I need to register as an APIS for a visa	1.9851	1	4.1493	5	0.0000	0.0000	0.0000
Q25	I know the areas I need to check for a passport	4.2239	5	4.6567	5	0.0135	**0.0579**	0.0190
Q26	I know what information I need to register as an APIS for a passport	1.8955	1	4.1493	4	0.0000	0.0000	0.0000
Q27	I know the problems that can occur with the lack of APIS records.	2.1642	1	4.0746	4	0.0000	0.0000	0.0000

MTU - JBMS
Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi
Malatya Turgut Özal University Journal of Business and Management Sciences
ISSN: 2717-7890
Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

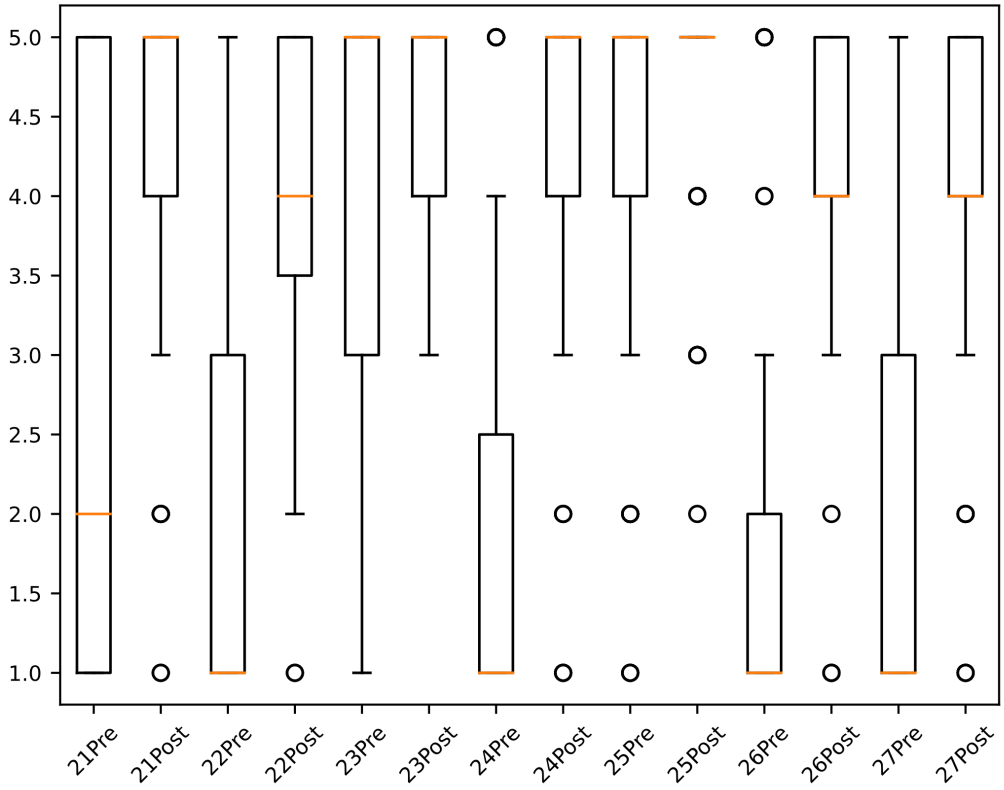

Figure 6: Results of part 5.

Part 5 consists of questions related to the procedures related to the registration of the information of travel documents, such as passports, visas, and residence cards, where responsibility and risk are the highest in the check-in process. In Table 5 and Figure 6, results of the section 5 are given. There are seven questions in this section called APIS (Advance Passenger Information System) operations. When statistical results examined, a significant difference was found between the pre-test and final test in the seven questions. When the question averages were examined based on this situation, the average of the question "I know the importance of the APIS Registration" increased from 2.69 to 4.25, the average of the question " I know the information required in APIS Registration" increased from 2.03 to 4.09, and the average of the question "I know what information I need to register as an APIS for a visa" increased from 1.99 4.15. Similarly, the average of the question "I know what information I need to register as an APIS for my passport" increased from 1.90 to 4.15, while the average of the question "I know the problems that can be experienced in the absence of APIS registration" increased from 2.16 to 4.07. While the difference between the pre-test and post-test averages for these questions turned out to be quite large, the average of the question "I know the areas I need to check for the visa" increased from only 4.10 to 4.67, and the question "I know the areas I need to check for the passport" increased from only 4.22 to 4.66. In question 25, there is a similarity in Mann-Whitney U test.

When the results are evaluated; In the theoretical training, it was concluded that the points to be checked for passport and visa were learned in an important way, these deficiencies could be eliminated with the program training, where other processes were partially incomplete, and the level of knowledge related to APIS operations could reach a level much higher than the average after the use of digital programs. In the question 25, according to the Mann-Whitney U test, it

MTU - JBMS
Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi
Malatya Turgut Özal University Journal of Business and Management Sciences
ISSN: 2717-7890
Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

may be concluded that the data is similar. However, since the P-value is very close to the critical value and results of the other two test methods indicate the opposite, it has been accepted that the two data sets are not similar.

Table 6: Results of part 6.

		Pre Test		Post Test		P Values		
Q. No.	**Questions**	**Mean**	**Median**	**Mean**	**Median**	**T**	**Mann-Whitney U**	**Wilcoxon**
Q28	I know how to create Digital Boarding Cards	2.1343	1	4.2239	5	0.0000	0.0000	0.0000
Q29	I know how to create digital baggage coupons	2.0746	1	4.2537	5	0.0000	0.0000	0.0000
Q30	I know how to enter special status information for the passenger	2.3284	2	4.5522	5	0.0000	0.0000	0.0000
Q31	I know the types of passengers who require special attention related to the trip	3.9851	5	4.7463	5	0.0001	0.0022	0.0003
Q32	I know how to create cabin information sheet form	1.6567	1	4.0746	4	0.0000	0.0000	0.0000
Q33	I know how to process mileage numbers	1.4776	1	3.5672	4	0.0000	0.0000	0.0000
Q34	I know how to enter information for passengers who will use CIP	1.4328	1	4.0746	5	0.0000	0.0000	0.0000
Q35	I know how to create a no-show passenger list	1.6119	1	3.7612	4	0.0000	0.0000	0.0000
Q36	I know how to create a passenger manifest	2.2985	2	4.3134	5	0.0000	0.0000	0.0000
Q37	I can create a NOREC passenger record	1.4328	1	3.4925	4	0.0000	0.0000	0.0000
Q38	I know how to do check-in offload	1.7313	1	4.0597	5	0.0000	0.0000	0.0000

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Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi
Malatya Turgut Özal University Journal of Business and Management Sciences
ISSN: 2717-7890
Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

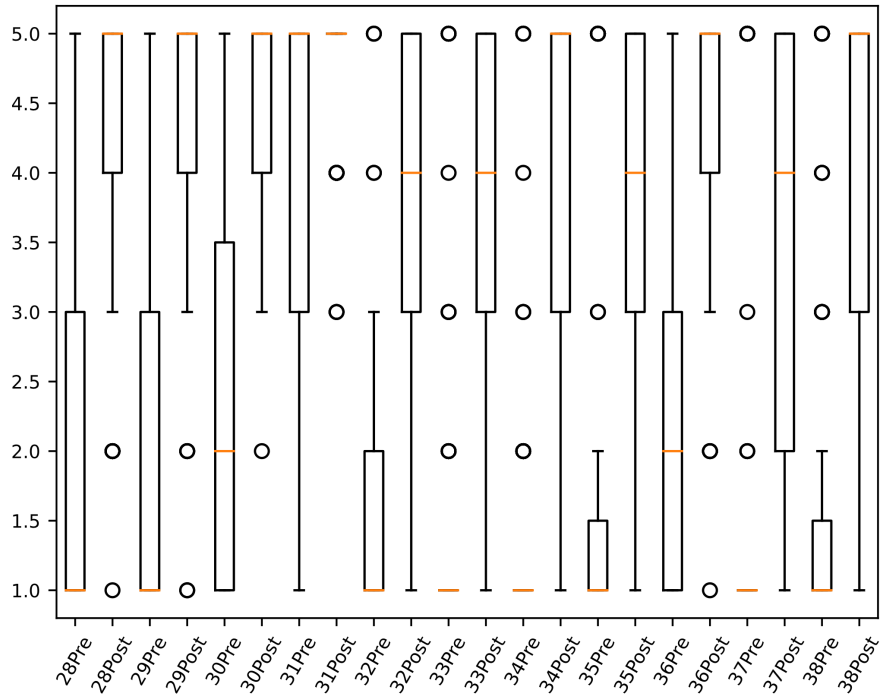

Figure 5: Results of part 6.

Part 6 consists of questions about the procedures carried out in addition to the main procedures in the check-in process, which are not carried out for each passenger, but should be used when necessary. In Table 6 and Figure 7, results of the section 6 are given. There were 11 questions in the check-in supplementary section. According to statistical results, a significant difference was found between the pre-test and final test for 11 questions. In this context, changes in the averages of the questions were examined. The average of the question "I know how to create Digital Boarding Cards" increased from 2.13 to 4.22, the question " I know how to create digital baggage coupons " increased from 2.07 to 4.25, the question "I know how to enter special status information for the passenger" increased from 2.33 to 4.55, and the question "I know how to create a passenger manifest" increased from 2.30 to 4.31. Since these processes are mandatory processes carried out in manual check-in, it can be said that basic knowledge is obtained in theoretical education, and knowledge is increased with digital application. The average of the question "I know how to produce a cabin information sheet form" increased from 1.66 to 4.07, the question "I know how to process a mileage number" from 1.48 to 3.57, the question "I know how to enter information for passengers who will use CIP (Commercial Importan Person) Lounge" from 1.43 to 4.07, the question "I know how to create a No-Show passenger list" from 1.61 to 3.76, the question "I can create a NOREC (No Record) passenger record" from 1.43 to 3.49, and the question "I know how to do check-in offload" from 1.73 to 4.06. It has been observed that the theoretical knowledge for these additional processes is insufficient, and an above-average level of knowledge can be reached with the digital program. The average of the question "I know the types of passengers who require special attention related to the trip" increased from only 3.99 to 4.75. This situation shows that there is a significant acquisition of knowledge about passengers who require special attention in theoretical training; the program only helps consolidate knowledge.

MTU - JBMS
Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi
Malatya Turgut Özal University Journal of Business and Management Sciences
ISSN: 2717-7890
Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

When the results are evaluated; It can be said that the compulsory procedures related to check-in procedures are learned in theoretical training, but learning with the digital program has increased significantly, while the additional non-compulsory procedures are missing in the theoretical training can be learned with the digital program. It was concluded that the types of passengers requiring special attention were strengthened with the digital program, where they were learned significantly in theoretical training.

Table 7: Results of part 7

		Pre Test		Post Test		P Values		
Q. No.	**Questions**	**Mean**	**Median**	**Mean**	**Median**	**T**	**Mann-Whitney U**	**Wilcoxon**
Q39	I know the purpose of boarding process	4.6269	5	4.7910	5	**0.1809**	**0.3135**	**0.1735**
Q40	I know how to do the boarding	3.0597	3	4.5373	5	0.0000	0.0000	0.0000
Q41	I know how to access information about passengers who did not board the flight	2.1642	1	4.3134	5	0.0000	0.0000	0.0000
Q42	I know how to finalize the boarding process.	2.5075	2	4.5224	5	0.0000	0.0000	0.0000

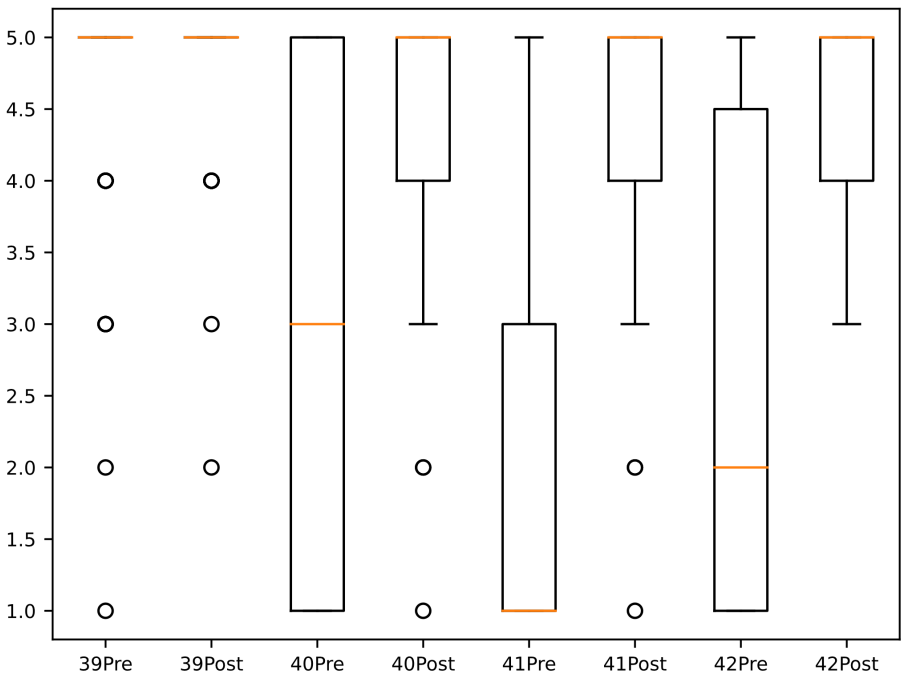

Figure 6: Results of part 7.

Part 7 covers Boarding Procedures, which can be summarized as the boarding of checked passengers, another basic process of passenger services. In Table 7 and Figure 8, results of the section 7 are given. There were four questions in the boarding procedure section. As a result of statistical testing methods, the average scores of the participants before the digital program training (pre-test) and after the training (final test) were evaluated; No significant difference was

MTU - JBMS
Malatya Turgut Özal Üniversitesi İşletme ve Yönetim Bilimleri Dergisi
Malatya Turgut Özal University Journal of Business and Management Sciences
ISSN: 2717-7890
Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

found for the question "I know the purpose of the boarding process". As this is the basic process of passenger services, it can be said that basic knowledge about boarding is acquired through theoretical training. However, a significant difference was found for the other three questions regarding boarding procedures. In this context, when the question averages were examined, it was observed that the average of the question "I know how to do the boarding" increased from 3.06 to 4.54, the question " I know how to access information about passengers who did not board the flight " increased from 2.16 to 4.31, and the average of the question "I know how to finalize the boarding process" increased from 2.52 to 4.52.

Table 4: Results of part 8.

		Pre Test		Post Test		P Values		
Q. No.	**Questions**	**Mean**	**Median**	**Mean**	**Median**	**T**	**Mann-Whitney U**	**Wilcoxon**
Q43	I know how to close the finished flight.	1.6866	1	3.9254	4	0.0000	0.0000	0.0000
Q44	I know how to archive flight documents	1.5075	1	3.4030	3	0.0000	0.0000	0.0000
Q45	I know how to access past transactions	1.6716	1	3.4925	4	0.0000	0.0000	0.0000

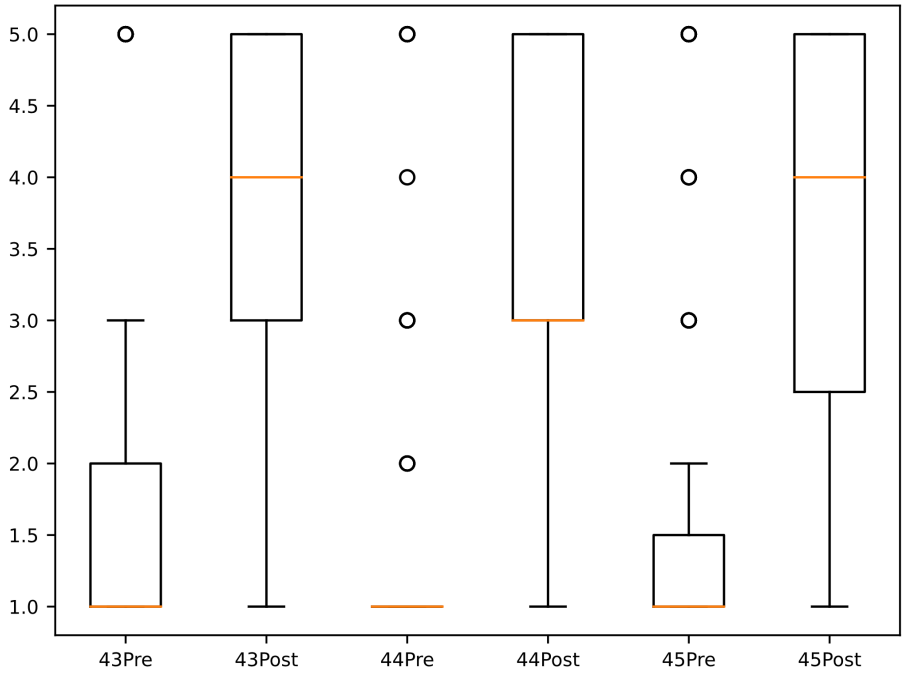

Figure 7: Results of part 8

Part 8 covers the final operations after the completion of the passenger service processes, including the closure of the flight and necessary archiving procedures. In Table 8 and Figure 9, results of the section 8 are given. There were three questions in the final procedure section. According to the statistical results, a significant difference was found between the pre-test and post-test for the three questions. In this context, when the averages are evaluated, it is seen that the average of the question "I know how to close the finished flight." increased from 1.69 to 3.93, the average of the question "I know how to archive flight documents" increased from 1.51 to 3.40, and the average of the question " I know how to access past transactions" increased from 1.67 to

Cilt/Volume:4, *Sayı/Issue*:2, *Yıl/Year*:2023, *Sayfa/Page*:123-142 *ISSN:* 2717-7890

3.49. It can be said that theoretical education was not sufficient for learning post-processing and that the level of learning increased with the digital program. However, one could argue that that learning about post-processing did not reach a very high level, even with the program.

When evaluated in general, it is seen that participants can only have basic knowledge of passenger service processes with theoretical training, and there may be significant deficiencies in this knowledge. With digital program training, unlearned passenger service processes can be learned, incomplete or poorly learned processes can be learned at a high level, and the learned knowledge can be reinforced. In this context, it is clear that digital program training will significantly contribute to passenger service training.

5. DISCUSSION AND CONCLUSION

There have been significant developments in airport passenger service processes with the development of technological systems and digitalization processes. Digital tools, such as computerized reservation systems, check-in and boarding programs, and ticket sales programs, have become used by all airline companies. In addition, kiosk check-in or self-baggage systems, which are called self-services, are all computer programs. The need for a qualified workforce that can use these programmes is constantly increasing. In addition, it takes a long time for personnel employed by aviation business to master these programs, which causes operational disruptions. Therefore, it is important for institutions and organizations providing aviation education to train a qualified workforce with digital skills to meet the needs of the sector in the context of vocational education.

For this reason, this study aims to simulate the programs used in the sector by creating a digital program demo in the context of passenger services. In this way, it was possible for students to establish a connection between theoretical knowledge and practical knowledge more easily and quickly when they entered the sector. The data obtained from students before and after the simulation also supported this claim. Thus, when digital program training is adapted to passenger service training processes, it will have a significant impact on the training of qualified personnel who will carry out airport passenger services. In today's digitalized world and the aviation sector, it is also clear that the knowledge learned through digital education and the ability to use programs will increase digital adaptation.

Future studies should investigate the effect of using similar digital and innovative methods on the qualifications of students in other areas of vocational aviation education. These and similar methods are thought to be promising for many institutions with vocational education curricula. Moreover, the results of the study show that the digital transformation in vocational education will comply with the expectations of aviation businesses**.**

ACKNOWLEDGE

This study was prepared as an output of the Scientific Research Project (BAP) number 24001 supported by Ege University.

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