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COVİD-19'UN BİÇİMLENDİRİCİ DEĞERLENDİRMEYE DAYALI OLARAK BİLGİSAYAR PROGRAMLAMA DERSİNİ ALAN ÖĞRENCİLERİN PERFORMANSLARINA ETKİSİ*

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Özet

Dünya Sağlık Örgütü (WHO), yeni tip koronavirüs (Covid-19) salgınından dolayı 27 Eylül 2021'e kadar dünya çapında dört-yüz seksen-üç milyondan fazla doğrulanmış vaka olduğunu bildirmiştir. Dünyanın dört bir yanındaki hükümetler, Covid-19'un yayılmasını önlemek için sosyal mesafe önlemlerini uyguladı. En etkili önlemlerden biri okulların kapatılması ve yüz yüze/geleneksel eğitimin askıya alınmasıydı. Bu anlamda, Covid-19'un Türkiye'deki bir üniversitede biçimlendirici değerlendirmeye dayalı olarak Java programlama dili modülünü alan öğrencilerin performanslarına etkisini değerlendirdik. 83 öğrencinin altı bilgisayar laboratuvarı sınav sonucu analiz edilmiştir. Bir örneklenmiş bağımlı t-testi gerçekleştirilmiştir (p-değeri = 0.0000 <0.05). İlk dört laboratuvar dersi yüz yüze/geleneksel (Covid-19'dan önce), geri kalan iki laboratuvar dersi ise (Covid-19'dan sonra) çevrimiçi gerçekleştirilmiştir. Analiz sonuçları, Covid19 salgını sırasında eğitimin yüz yüze eğitim

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yerine çevrimiçi olması nedeniyle öğrencilerin performansının düştüğünü ortaya koymaktadır. Bu yüzden, bu çalışma, bilgisayar programlama modülünün öğretiminde çevrimiçi eğitime göre daha etkili ve verimli bir yöntem olan yüz yüze/geleneksel eğitimin önemini vurgulamıştır.

Anahtar kelimeler: Covid-19, Bilgisayar Programlama Modülü, Yüz Yüze Eğitim, Çevrimiçi Eğitim.

COVİD-19 IMPACT ON STUDENTS' PERFORMANCES İN COMPUTER PROGRAMMİNG MODULE BASED ON FORMATİVE ASSESSMENT

Abstract

The novel coronavirus disease 2019 (Covid-19) pandemic has affected more than four-hundred and eighty-three million confirmed cases worldwide by 27 September 2021, reported by the World Health Organisation (WHO). Governments around the world implemented social distancing measures to prevent the spread of the novel coronavirus disease-2019 (COVID-19). One of the most effective measures was the closure of schools and a suspension of face-to-face/traditional education. In this sense, we evaluated the Covid-19 impact on students' performances in the Java programming language module based on formative assessment in a university in Turkey. Six computer laboratory exam results of 83 students were analysed. One sampled dependent t-test is performed (p-value=0.0000<0.05). Note that the first four laboratories were face-to-face/traditional (before Covid-19) while the rest two laboratories were online (after Covid-19). The analysis results reveal that the performance of students decreases because the education is online instead of face-to-face education during the Covid19 pandemic. Therefore, this paper has underlined the importance of face-to-face/traditional education which is a more effective and efficient method for the teaching of computer programming modules than online education.

Keywords: Covid-19; Computer Programming Module, Face-to-Face Education, Online Education

Introductıon

Most of the governments decided to start distance education after Covid-19 appeared, and therefore the popularity of distance learning has grown rapidly worldwide. For instance, all universities turned distance (online) learning in Turkey in order to prevent the spread of Covid-19. In education, there are three types of assessments consisting of formative, diagnostic and summative assessment. Formative and diagnostic assessments have the same purpose, which is to improve the learning experience (Buyrukoglu et al., 2019). The summative assessment aims to measure students' understanding of a subject (Buyrukoglu, 2018). For an assessment to be formative, it should provide

feedback that refers to the existence of a gap between the students' real levels and the required standard. It should also give students guidance to improve their work and reach the required standard (Ramaprasad, 1983; Sadler, 1998). Lab work is an example of formative assessment since the lab tutor provides feedback/answers to students about student questions during lab work. Thus, this study aims to analyse the students' performances in computer programming module based on lab work and formative assessment before and after Covid 19. Detailed information about the dataset is available in Section 2.1. Also, this study purposes to evaluate the advantages and disadvantages of face-to-face learning and distance learning.

In literature, the majority of the researchers have agreed that there is no significant difference between face-to-face learning and distance learning on students' grades in various modules such as math (Ashby et al., 2011); introductory management (Larson & Sung, 2009); sociology (Driscoll et al., 2012), etc. Also, Shea & Bidjerano (2014) stated that students have satisfactory grades in distance learning if they attend the lecture regularly. On the other hand, some studies have revealed that distance learning negatively affects students learning outcomes and objectives. For instance, a large percentage of student grades reduced at least one or two grades in distance learning (Atchley et al., 2020). Similarly, Xu & Jaggars (2013) and Johnson & Mejia (2014) point out that students had worse performance in distance learning compared to students in face-to-face learning. However, Hannay (2006) revealed that distance learning may enable students to achieve higher learning outcome and grade if the focus is on regular learning and course materials are prepared very well.

It can be inferred from the previous paragraph, there is confusion about which education type (face-to-face and distance) is better in terms of students' grades and learning outcomes. Thus, this research intends to compare the efficiency of face-to-face learning (before Covid-19) and distance learning (after Covid-19) using students' lab grades in the computer programming module. In this sense, students' lab work grades before and after Covid-19 were analysed by applying the t-test. We believe that our study helps universities in terms of using the appropriate education type for lab works in the department of computer science. It can be considered as a contribution of this study. The research questions of this research, therefore, are: Can distance learning be more beneficial for students in terms of students' grades and learning outcomes compared to face-to-face learning?

The structure of the paper is as follows: the next section introduces a method which can be listed under two headings: dataset collection and the data analysis method. Section 3 presents results and discussion. Section 4 provides the conclusion section outlines the potential for future work in this area.

1. Method

1.1. Data Collection

Data were collected to compare the efficiency of face-to-face and distance learning for students in the computer programming module in this research. Six different questions (in different six lab works) were asked to students taking semester two (2020) of the computer programming module at a university in Turkey. The first four lab works were made based on face-to-face learning before Covid-19. Then, the last two lab works were made based on distance learning after Covid-19. Finally, 83 students attempted these lab works and they used the Java programming language to complete the lab questions.

1.2. Data Analysis Method

Dependent sample t-test is used when the observations are collected in pairs and the two samples are dependent, such as before and after or pre and post processes (Čechová et al., 2019). The dependent sample t-test can be calculated as follows:

$$t = \frac{\bar{d}}{s_D / \sqrt{n}}$$

where n is the sample size, $\bar{d}$ and s_D are the mean and the standard deviation of the differences between the first and the second result of all pairs.

2. Results and Discussion

This plot (Figure 1) represents the longitudinal trajectory for each student lab grade. The students' performance after Covid-19, indicated by the vertical black line, tend to decrease. Half of the students did not submit (or fail to attend) the lab assessment just after Covid-19. This increases to 67 for the last lab assessment. Only 16 students submit their 6th assessment. This can be explicitly seen in Figure 2 (histogram). These histograms present the distribution of the average grade of lab assessment before and after Covid-19. The mean grades resemble various before Covid-19, it seems right-skewed after Covid-19.

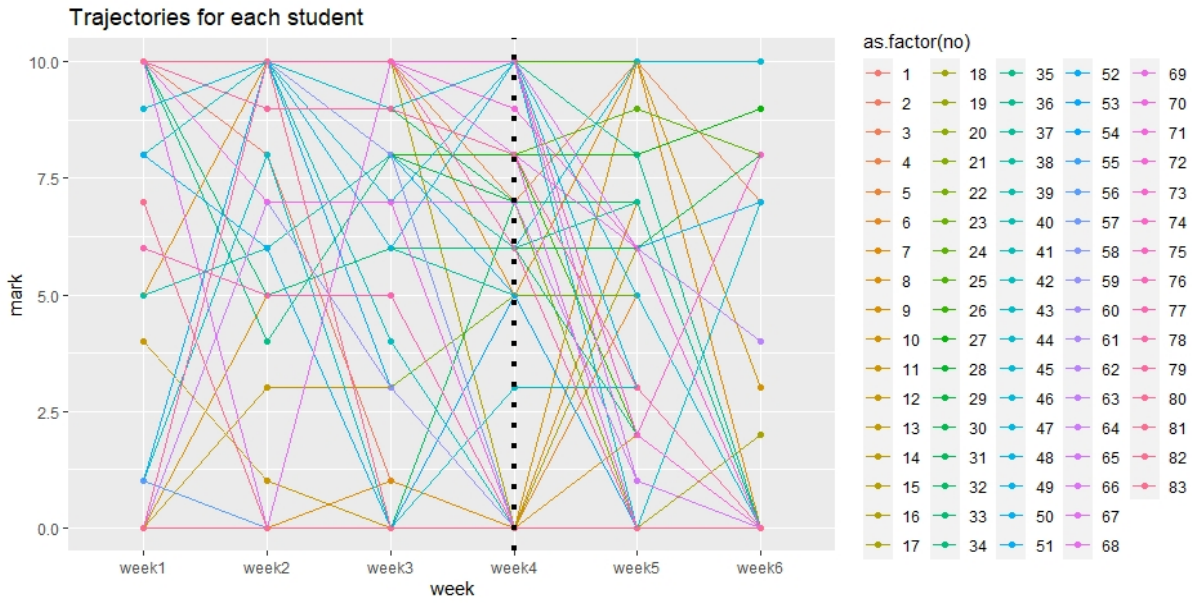

Figure 1. The longitudinal trajectory for each student lab grade

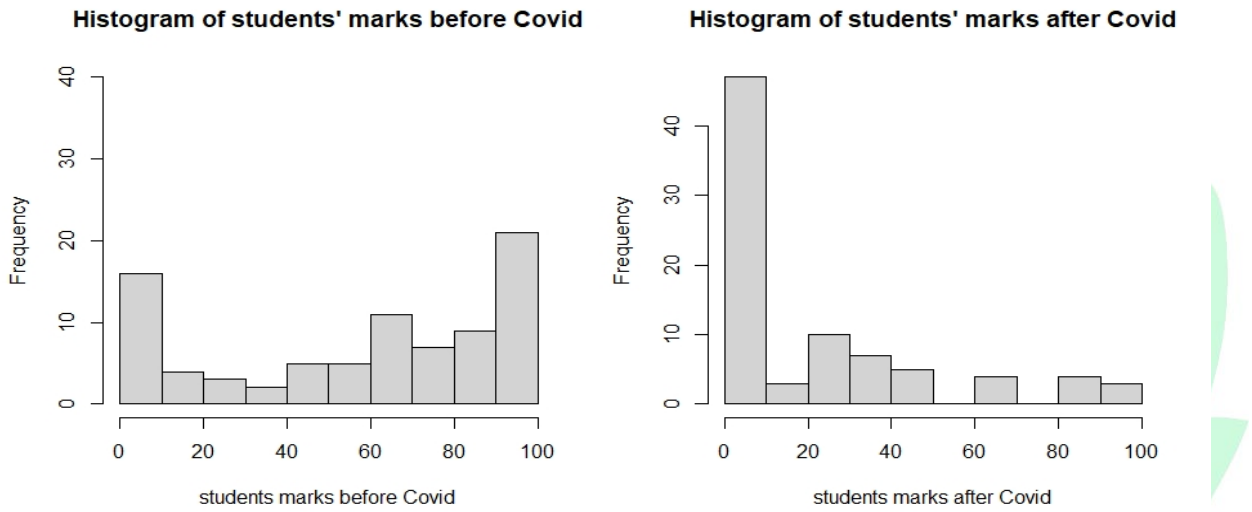

Figure 2. Distribution of the average grade of lab assessment before and after Covid-19

It is investigated if the difference between the mean grades before and after covid-19 is statistically significant. Thereby, we analysed this data by performing paired one-sample t-test (see Table 1). The t-test results indicate that there was a statistically significant average difference between the students' lab performance before and after Covid-19 ($t_{82}=10.579$, $p< 0.001$). On average, the students' average grade up to 4th lab was 36.6 higher than the average grade after Covid-19 (95% CI[29.71 43.48]).

Table 1. One sample statistics

	t	df	p-value	Mean difference	95% Confidence Interval of the Difference	
					Lower	Upper
Mean Difference sts perf.	10.579	82	<0.000	36.60	29.71	43.48

Figure 3 shows an even clear image of the difference in the performance of the students' lab assessments. As there is a clear difference between them, it can be concluded that distance learning in lab works and Covid-19 affected students' performance negatively.

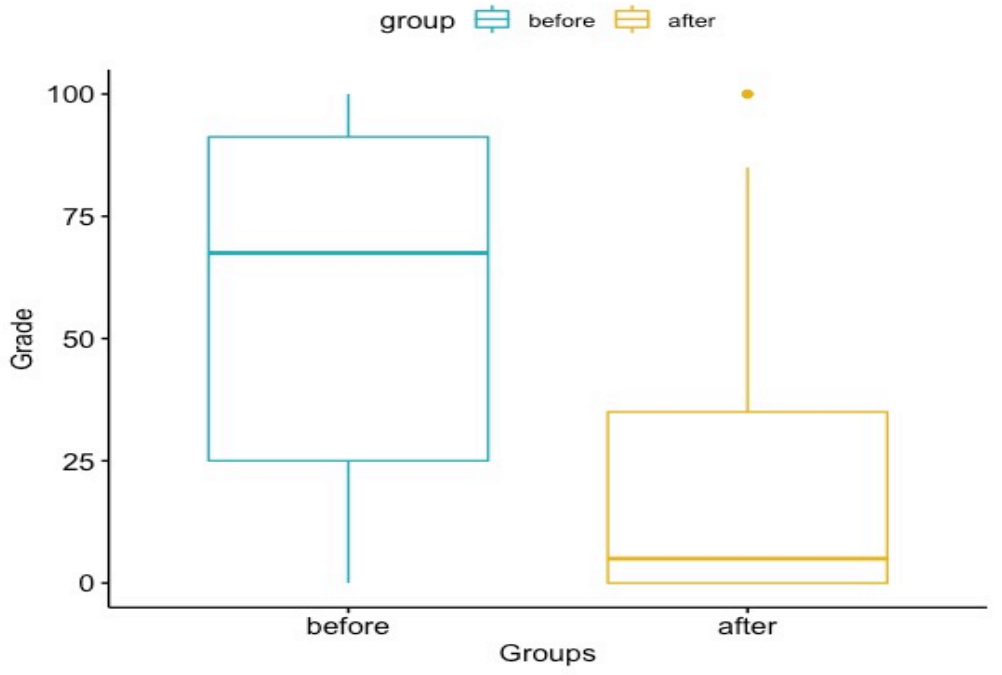

Figure 3. The difference in the performance of the students' lab assessment

Therefore, these tests highlighted that face-to-face education is a better approach for teaching and learning than distance education. The major advantages of traditional education are as follows. Students can get an instant answer to their questions in face-to-face education, unlike distance education. Questions that cannot be answered immediately in distance education prevent students from having sufficient information about the subject. Although the distance education method represents an innovative alternative to traditional education, in traditional education, there are no learning difficulties due to systemic errors caused by the technological platforms used in distance education. Besides, in order for teachers to get used to distance teaching methods, they should be trained. Teachers who have not adopted these methods and have not fully trained may cause students not to learn effectively in distance education. Another reason for the underperformance may be that

students have difficulty using the systems of distance learning. Therefore students should also be trained to get used to distance methods. In addition, students may experience learning difficulties depending on their age, gender and race as analysed in (Muilenburg & Berge, 2005; Pfeiffer et al., 2008; Sullivan et al., 2008).

The above discussion can be valid for both theoretical and laboratory courses, it is worth mentioning that much better learning outcomes can be achieved when laboratory courses are taught with traditional methods. In this regard, our experimental results emphasise the validity of traditional education. The results have further strengthened our conviction that traditional education models for the lectures that require practice e.g. computer programming modules are a more effective and efficient method than online education.

3. Conclusion

The closure of schools and distance learning is carried out as a most effective precaution to prevent Covid-19 quick spread. Such precaution had decreased the spread speed of Covid-19 to some extent in most countries but the distance learning had negative effects on students to learn lectures that require practice such as computer-based programming modules. Therefore, this paper evaluated the Covid-19 impact on students' performances in the Java programming language module based on formative assessment in a university in Turkey. The one sampled dependent t-test analysis based on six computer laboratory exam results of 83 students revealed that the performance of students decreases in distance learning compared to traditional face to face education. The analysis result offers vital evidence for the importance of face to face/traditional education as it evaluates the performance of students before and during the Covid-19 pandemic.

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