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THE EFFECT OF THE DISTANCE LEARNING PROGRAM DESIGNED FOR THE PROGRAMMING LANGUAGE ON THE ACADEMIC ACHIEVEMENT OF STUDENTS*

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Abstract

Advances in technology are closely related to many areas. It is possible to see the effect of technology in administrative sciences, health sciences, educational sciences and many areas. These developments shape new designs and innovation areas. Distance education platforms keep up with developments in technology. It is seen that information systems constantly renew themselves. In this study, quasi-experimental research model is used. The aim of this study is to examine a distance education program designed for programming language teaching in terms of students' academic success and ability to practice. This research was carried out with the students of Doğa College in Osmaniye in 2019. 2 classes of 32 students constitute the sample of the study. There are 14 students in the experimental group and 18 students in the control group. The students in the experimental group made their own applications after the programming language training with the application under the title "Try Yourself" in the software. A web-based learning environment designed for students has been developed. The learning environment is designed according to the principles of web-based environment development. 10-question pre-test and post-test questions were applied to the students at the beginning and end of the training. In addition, at the end of the training, a five-point Likert-type scale with 50 questions was applied. At the end of the research, it was determined that there is no significant difference in the learning environment designed for students' academic achievement and ability to practice.

Keywords ***:*** *Management information systems, Programming language, Student academic success.*

Jel Classification ***:*** *O30.*

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PROGRAMLAMA DİLİ İÇİN TASARLANMIŞ UZAKTAN ÖĞRENME PROGRAMININ ÖĞRENCİLERİN AKADEMİK BAŞARILARI ÜZERİNDEKİ ETKİSİ

Öz

Teknolojideki gelişmeler birçok alanla yakından ilgilidir. Yönetim bilimleri, sağlık bilimleri, eğitim bilimleri ve birçok alanda teknolojinin etkisini görmek mümkündür. Bu gelişmeler yeni tasarımları ve inovasyon alanlarını şekillendirmektedir. Bilişim sistemlerinin sürekli kendini yenilediği günümüzde, uzaktan eğitim platformları da teknolojideki gelişmelere ayak uydurmaktadır. Bu çalışmada yarı deneysel araştırma modeli kullanılmıştır. Bu çalışmanın amacı, programlama dili öğretimine yönelik tasarlanmış bir uzaktan eğitim programını öğrencilerin akademik başarıları ve uygulama yetenekleri açısından incelemektir. Bu araştırma 2019 yılında Osmaniye'deki Doğa Koleji öğrencileriyle gerçekleştirilmiştir. 32 öğrenciden oluşan 2 sınıf araştırmanın örneklemini oluşturmaktadır. Deney grubunda 14, kontrol grubunda 18 öğrenci bulunmaktadır. Deney grubundaki öğrenciler, yazılımda "Kendini Dene" başlığı altındaki uygulama ile programlama dili eğitimlerinin ardından kendi uygulamalarını yapmışlardır. Öğrenciler için tasarlanmış web tabanlı bir öğrenme ortamı geliştirilmiştir. Öğrenme ortamı, web tabanlı ortam geliştirme ilkelerine göre tasarlanmıştır. Eğitimin başında ve sonunda öğrencilere 10 soruluk ön test ve son test soruları uygulanmıştır. Ayrıca eğitimin sonunda 50 soruluk beşli Likert tipi ölçek uygulanmıştır. Araştırma sonucunda öğrencilerin akademik başarıları ve uygulama becerileri için tasarlanan öğrenme ortamında anlamlı bir fark olmadığı tespit edilmiştir.

Anahtar Kelimeler *: Yönetim bilişim sistemleri, Programlama dili, Öğrenci akademik başarısı.*

Jel Sınıflandırması *: O30.*

INTRODUCTION

Technological new tools used today have changed the communication types of individuals and enabled them to grow more qualified. All these innovations have also affected learning environments. At the point where our age has come, information technology becomes very important for societies in having producing populations. The complexity of the teaching and the increase in the information necessitate the involvement of computers in education. For these reasons, the use of technology in education ensures maximum efficiency in education towards the desired goals (Atam, 2006: 3; Çevik, 2006: 14). The tools that can be used in technology in education are quite wide. Many studies show that different fields are integrated with education (Baz, 2010: 1; Mutlu, 2016: 6; Özdemir, 2015: 9).

People have to adjust their time effectively to keep up with the demands of the age. In this sense, the growth of information in motion can only be achieved by using information technologies and time more effectively. Education services must be provided at a rate equal to the speed of development and change mentioned. These are not possible with traditional education methods. In this sense, the internet, which enables individuals to access the desired information at the desired place and time, is an important advantage. Many studies are technology-oriented rather than education and training. There are studies in which some technologies are used only in education but their contribution to the field is not understood. Since such educational programs do not conform to scientific values, they often fail to reach their goals because they contain many inaccuracies from the point of view of "instructional design" (Düzakın & Yalçınkaya, 2008: 226; Gülnar, 2003: 260–261). Today, with the spread of epidemic diseases worldwide, such as COVID 19, it is seen that people provide their daily activities, especially education, through internet environments. It can be said that the educational software developed show similarities. Whether the increase in the number of distance education environments is proportional to the increase in their qualifications is a current topic for researchers.

Users' personal differences, readiness levels, computer literacy and some other features are important in the development of software. In the software development process, besides the programming knowledge, the users should be guided and the environment should be provided for

personal application. Now, users are advancing the processes individually at the computer. It is a current need to design and use educational software in this way.

In the research, "What is the Effect of Distance Education Program Designed for Programming Language Teaching on Students' Academic Achievement?" the answer to the question has been investigated. Due to the pandemic, the transition to the compulsory distance education system and the lack of opportunity to provide the training face to face, the study is important. The program used in the research is important because it is an environment where students can try their own learning. In order to show that the programming language can be taught at a young age, and again, it is predicted that it will definitely appear in the future, a study was carried out with 6th grade students.

Environments designed in the field of distance education provide an interactive and dynamic learning process with teachers (TeknologWeb, 2015; Alford et al., 2002; Ronald & Jamie, 1999; Sherry, 1995; Jolliffe, Ritter, Stavins, 2001). The fact that Python programming language has just become popular and its inclusion in the curriculum makes our study subject important. It is important for us to work again, since the transition to the compulsory distance education system due to the pandemic and the lack of opportunity to provide the training face to face. It is predicted that this study will guide researchers in future studies.

I. METHODOLOGY

In this section, information about the research model, data sources, data collection tools and analysis of the data obtained in this direction are included.

In this study, quasi-experimental research model was used. There is a comparison in experimental models. A comparison of the changes within a particular phenomenon, that is, the differences between these things, is made. In this study, one of the groups is the experimental group and the other is the control group. Metin (2014: 60) states that it is a random decision that one of the groups previously formed in quasi-experimental studies is an experimental group and one is a control group. In addition, since it is not possible for researchers working in the field of education to conduct real experimental studies, quasi-experimental designs are created in this way.

In the research, primary school 6th grade students in Osmaniye province constitute the population. Its sample consists of 6th grade students of Osmaniye Doğa College in the fall semester of 2019–2020. 32 students are studying in two classes randomly selected for the sampling. While the 6 / A class constitutes the experimental group chosen completely randomly from these branches, the 6 / C class constitutes the control group. Class 6 / C was trained only according to the traditional education method. Lessons were given to the 6 / A class and the application was carried out with the web-based learning environment with the prepared program.

The "Educational Software Evaluation Form" of Ateş (2011: 18–21) in the literature and pre-test and post-test questions were used to measure the academic success of the learners in order to carry out the measurements and evaluations needed in conducting the research. While the questionnaire was applied only to the experimental group, the pretest-posttest was done to both groups. The web-based learning environment was prepared by the researcher for the experimental group students before the training. In a web-based learning environment, the Python programming language is designed to be understood by learners in general terms from Baz (2018: 1–71)'s book.

In order to carry out the research, at the beginning of the fall semester of the 2019-2020 academic year, it was deemed appropriate that the research was conducted by the researcher in the 6th grade students of secondary school, in their computer laboratory and in the information technologies lesson once a week. Necessary preliminary examinations have been made in the computer laboratory of the learners' school and the classroom environment has been made ready for the education to be given. There are 10 laptop computers in total in the laboratory. There are 14 students in the experimental group.

The number of students in the control group is 18. Only the things that were told to the experimental group were applied on the computer, and the control group was taught according to the traditional education method. That is, sufficient number of computers are provided to perform the application. The experimental group students were informed by the researcher to use the software. The students in the experimental group made their own applications after their programming language training with the application under the title of "Try It Yourself" in the software.

II. FINDINGS

In this section, the findings consisting of the data obtained as a result of the steps in the method section of the research are emphasized. The findings are dealt with in a specific systematic. First, the tables formed by the findings were included, then the table was explained briefly and tried to be interpreted.

II.I. Descriptive Statistical Information of the Students Participating in the Study

The only demographic information available in the questionnaire for learners is gender. Since the survey is for one class, the age of the class, educational status, etc. Since the information will be the same, the tables were examined only according to the gender information.

Table 1. Distribution of the Students Participating in the Study According to Gender

Gender	N	%
Male	15	46,875
Female	17	53,125
Total	32	100

The percentages of the total number of male and female students in the experimental and control groups of the students included in the study are generally shown in the chart. In Table 1, a general gender distribution of 17 female and 15 male students is given.

In Table 2, the distribution of the students included in the study according to the teaching group is given.

Table 2. The Distribution of the Students Within the Scope of the Research According to the Teaching Group

Gender	N	%
Control Group	18	56,25
Female	14	43,75
Total	32	100

The distribution of the students within the scope of the study according to the experimental and control groups is given in Table 2. According to Table 2, 18 of the students participating in the study are in the control group and their rate is approximately 56%. 14 students are in the experimental group and their ratio is about 44%. It is seen that the number of students participating in both study groups is close to each other.

II.II. Students' Evaluation of Educational Software

The SPSS program was used to analyze the data generated by the Likert type questionnaire applied in the study. After the collected data were entered into the SPSS program one by one, the findings were evaluated by considering the opinions of the experts and the results were shown in tables. A five-point questionnaire was used to evaluate the educational features of the software. While analyzing the data, the arithmetic mean ($\bar{x}$) of the answers given to each question were examined in order to understand whether the software had educational qualifications. Answer points to be given to each question on the five-point scale applied to learners vary between 1.00-5.00.

The score ranges of five units (4/5) of 0.80 points each were determined as follows on the five-point scale applied to the students:

1.00-1.80 I don't agree at all

1.81-2.60 Slightly Agree

2.61-3.40 Intermediate Agree

3.41-4.20 Largely Agree

4.21-5.00 I totally agree

a. Examining student views on educational features of the software

It is stated that the participants most strongly agree with the proposition "The sentences should be clear and understandable in terms of the learning population" ($\bar{x}$ = 4.5). The proposition that “instructions should be clear and understandable” was another item that the students agreed with ($\bar{x}$ = 4,28). The students participating in the study ($\bar{x}$ = 4.28) stated that they agree with the proposition that "it should be free from unwanted elements (race, religion, language, violence, aggression, fear, gender discrimination)". In addition, the students express the view that "it should provide sufficient amount of practice and application opportunities". When the data of the students evaluating the educational features of the software are evaluated, it is seen that they agree with the proposal "Supporting the learning of course subjects" at the lowest rate. A second suggestion that the students agree with at a low rate on educational features is the suggestion that "Students should test their prior knowledge".

b. Examination of student views on the visual features of the software

In the evaluation questionnaire applied to students, visual design features consisted of 5 items. In the study, it is seen that the participants most agree with the proposition ($\bar{x}$ = 4.42) of "The suitability of page titles in terms of placement". The proposition "Designing the menus appropriately" was another item that the students agreed on ($\bar{x}$ = 4.35). When the students' views on the visual features of the software are examined, it is seen that the least common statements they agree with are "Too little or too much texts" ($\bar{x}$ = 3.71) and "Compliance with visual design principles" ($\bar{x}$ = 3.71).

c. Examination of student views on multimedia features of the software

In the evaluation questionnaire applied to the students, the part regarding the multimedia features of the software consisted of 7 items. In the study, it is seen that the participants most strongly agreed with the proposition ($\bar{x}$ = 4.28) that “stop, forward, backward, replay features work effectively for visual elements such as video”. The proposition that “all auditory elements (sound, music, speech, etc.) should be” was another item that the students agreed on ($\bar{x}$ = 4.14). Examining the students' views on the multimedia features of the software, it is seen that the least they agree with is "Enough animation" ($\bar{x}$ = 3.28).

ç. Examining student views on the content features of the software

The part regarding the content features of the software in the evaluation questionnaire applied to the students consisted of 7 items. In the study, it is seen that the participants most strongly agreed with the proposition ($\bar{x}$ = 4.78) "to include correct information in the content". The proposition

"Including up-to-date information in the content" was another item that the students agreed on ($\bar{x}$ = 4.64). When the students' views on the content features of the software are examined, it is seen that the least common statements they agree with are "Relating the subject to real life" ($\bar{x}$ = 3.5) and "Organizing the content from simple to complex / from concrete to abstract" ($\bar{x}$ = 3.5).

d. Examination of student opinions on the guidance and help features of the software

In the study, it is seen that the participants mostly agree with the proposition ($\bar{x}$ = 4.57) that there is a functional help menu in the software. The proposition that "the links between pages (forward, backward, home page) should be sufficient" was another item that the students agreed on ($\bar{x}$ = 4.21). When the students' opinions about the guidance and assistance features of the software are examined, it is seen that the least they agree with is "The necessary guidance about the use of the software is in the software" ($\bar{x}$ = 3.57).

e. Examination of student views on the installation and usage features of the software

In the study, it is seen that the participants mostly agree with the proposition ($\bar{x}$ = 4.64) that the functions of all items on the software screen should be clear and understandable. The proposition that "the software can respond to user commands in a short time" ($\bar{x}$ = 4.57) and "The software works without error" ($\bar{x}$ = 4.57) was another item that the students agreed. According to the opinions of the students about the guidance and help features of the software, it is seen that the least they agree with is "The presence of contact information with the software manufacturers in the user guide" ($\bar{x}$ = 3.42).

II.III. Programming Language Course Pre-test and Post-test of Experimental and Control Groups

In Table 3, the arithmetic mean and standard deviation values of the programming language course pretest and posttest scores of the experimental and control groups are given.

Table 3. Descriptive Statistics of the Experimental and Control Groups' Pre-test and Post-test Scores

Tests	Experimental Group		Control Group	
	$\bar{x}$	Sd	$\bar{x}$	Sd
Pre-test	1, 4286	3, 63137	4, 4444	6, 61747
Post-test	29, 6429	22, 40057	38, 0556	15, 82430

Descriptive statistics of pretest and posttest scores of experimental and control groups are given in Table 3. According to the data obtained, while the mean of pretest scores of the experimental group was $\bar{x}$ = 1.4286, the standard deviation values of the experimental group were found to be Sd = 3.63137. While the mean of the experimental group's posttest scores was $\bar{x}$ = 29.6429, the experimental group's standard deviation values were found to be Sd = 22.40057. While the mean pre-test scores of the control group were $\bar{x}$ = 4.4444, the standard deviation values of the control group were found to be Sd = 6.61747. In addition, while the control group posttest scores were $\bar{x}$ = 38.0556, the control group standard deviation values were determined as Sd = 15.82430.

Pretest and posttest scores of the experimental and control groups are graphed in Figure 1.

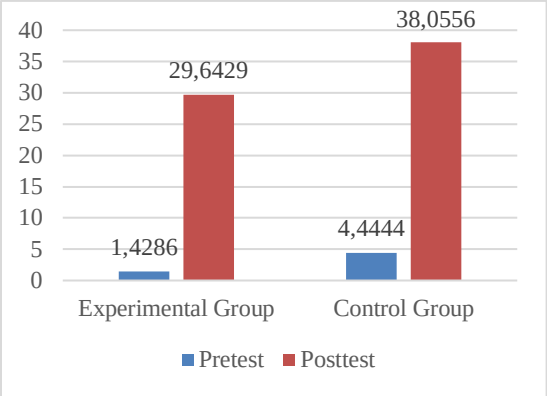

Figure 1. Pretest and Posttest Scores of the Experimental and Control Groups

The Academic Achievement Test was administered to the students as a pre-test and a post-test according to the sub-problem sentence: Is the distance education program designed for programming language teaching effective on the academic success of students. The Shapiro - Wilks test was used to test whether the pretest and posttest data of the experimental and control groups showed normal distribution. Saygı & Bilen (2016, p.736) states that normality test is important in determining which statistical formula the research trials can be tested with. The Shapiro - Wilks test of the study is shown in Table 4.

Table 4. Shapiro - Wilks Test Results for Academic Achievement Pretest and Posttest Scores

Tests	Groups	Shapiro - Wilks	p
Pretest	Control Group	.73	.01
Pretest	Experimental Group	.42	.00
Posttest	Control Group	.95	.70
Posttest	Experimental Group	.88	.06

As seen in Table 4, it is seen that the posttest scores of the control group and the experimental group do not violate the normal assumption (p> .05). It is seen that the pretest scores of the experimental and control groups violate the normal distribution assumption (p <.05).

As given in Table 4, the p values found by the normality analysis test after the Shapiro - Wilks test of the pretests of the experimental and control groups are less than .05. Whether there was a significant difference between the pre-test scores of the experimental and control groups was checked with the Wilcoxon Signed Ranks Test because the scores did not show a normal distribution. The results within this scope are given in Table 5.

Table 5. Non - Parametric Wilcoxon Test Results Related to Academic Achievement Pre-Test Scores

Score	Ranks	N	z	p
Experimental and Control Group	Negative Ranks	2	-1,035	,301
	Positive Ranks	5		
	Equal	7		
	Total	14		

As given in Table 5, the difference between the tests was statistically found as p> .001 as a result of the non-parametric Wilcoxon test in understanding whether there is a significant difference between the Academic Achievement Test pretest scores of the students in the experimental and control groups.

According to this result, no significant difference was found between the pre-test scores of the experimental and control group students.

CONCLUSION AND RECOMMENDATIONS

As a result of the development of technology and the need for lifelong learning, web-based distance education systems appear as a popular method in every sector. It is anticipated that web-based distance education will be discussed frequently in the past, today and in the future. It has been observed from the studies in the related research section that most of the topics include distance education or web-based learning.

In this study, in which the effect of distance education program designed for programming language teaching on students' academic achievement and ability to practice was investigated, no significant difference was found on behalf of the web-based distance education system compared with the traditional system as a result of the analysis. The absence of a significant difference in the results is not a completely negative result, on the contrary, it is seen that distance education has achieved the traditional education and even achieved as much success as it. In previous studies, it was observed that the web-based distance education system had no effect on the academic achievement of students and there were studies that did not find a significant difference (Sığın, 2020, p.102; Yıldırım, 2018, p.94; Baz, 2016, p.68; Güveli, 2004, p.327). A completely negative result is not observed in these studies. In general, learners are happy to benefit from distance education environments in addition to traditional education.

As a result of applied research, it was realized that programming language teaching and designing a web-based learning environment for programming language is a difficult process. In addition, it was concluded that designed distance education programs should have a comprehensive, understandable and user-friendly interface for learners. It is seen that academic success and ability to apply completely pass without understanding and learning this system well.

It was found that there was no significant difference between the average pre-test and post-test scores of the experimental group, where the web-based learning environment, which was designed in accordance with the principles of the distance education environment, was used together with the traditional education system, and the control group, which was fully trained according to the traditional system, on the academic achievement and ability to practice. In other words, a completely negative conclusion cannot be drawn here. The absence of a significant difference in the results shows that distance education is as successful as traditional education.

In addition to the traditional education environment, the use of the web-based education environment, which is in accordance with the principles of distance education, receives positive opinions from the learners. It is observed that the majority of the answers given by the learners to the questionnaire stated that the web-based distance education environment is beneficial for their better understanding, comprehension and learning of the lessons.

The web-based learning environment used in this study has been developed in accordance with the traditional education and distance education environment principles. For this reason, it is recommended to use the web-based learning environment developed in addition to the software to be developed in teaching the subjects in the research with the traditional system.

It may be suggested that they determine the working group well for the next studies. It should not be forgotten that the study group has an important and determining role in the research. The educational environment, the education level of the individuals, traditional and distance education materials are the factors that should be considered for researchers who will carry out the study meticulously.

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