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Abstract

This study investigated the effect of online teaching and individualized instruction in piano lessons of the department of music teaching on students" TPACK skills and achievements. The research was conducted on the basis of a pretest-posttest control group design. In the experimental group of the study, piano education was carried out with online learning and face-to-face individualized instruction, and in the control group, activities were carried out using the current distance learning method. Teaching activities lasted 20 lesson hours in the experimental and control groups. Piano Lesson Achievement Test and TPACK scale were used as data collection tools in the study. The Mann Whitney U test was used on the achievement and TPACK skills of the groups on the pretest and posttest scores. The findings of the research showed that the online learning and individualized instruction applied in the experimental group were more effective in the piano lesson achievement and some dimensions of the TPACK scale than the current curriculum.

Introduction

In the last 50 years, rapid growth has been observed in the education supply at all levels around the world. COVID-19 is the biggest challenge to education systems in history (Atabey, 2021; Atilgan & Tukel, 2021; Daniel, 2020; Paudel, 2021; Xhelili, Ibrahimi, Rruci, & Sheme, 2021). With the pandemic, many governments tried to get educational institutions to move to online and distance education almost overnight. Recent figures (UNESCO, 2020b) show that more than 191 countries around the world have had to end traditional face-to-face education with the closure of national level schools, as a result of the COVID-19 crisis. This crisis has affected approximately 1.5 billion students and 91.3% of the student population worldwide (Drane et al., 2020). With many countries that turned to online based distance education, UNESCO (2020b) has developed 10 key recommendations to ensure that learning remains uninterrupted during the COVID-19 crisis. There is global evidence that some countries have started to implement these recommendations in a minimum number during the period of mass education closures, including investigating whether the school is ready for closure, and the intention to ensure inclusiveness of distance education programs.

It is now commonplace around the globe to reproduce and implement the content of traditional classroom

lectures online. However, innovative technologies that will actively attract students through interactive lectures, tests, presentations and open discussions on online platforms have dominated the system, due to the limited face-to-face education. In all these aspects, the COVID-19 crisis has had a serious impact on traditional education processes. In this respect, universities can take advantage of this unexpected opportunity to discover shortcomings and activate online education practices through active strategies.

There has been a significant transition to online education in education systems in the first decade of the twenty-first century (Boz & Adnan, 2017; Saba, 2011; Thompson, & McDowell, 2019). Distance education has become increasingly important in all education and training levels in the last 30 years. As a sort of formal learning, distance learning is a major aspect in various educational settings through the employment of various technological applications that connect students with their instructors (Cakin, & Kulekci Akyavuz, 2021; Marpa, 2021; Moore et al., 2011; Simonson et al., 2011).

According to Daniel (2020), the COVID-19 pandemic has disrupted the lives of students in different ways, depending not only on their level and course of study but also on the point they have reached in their programs. Those coming to the end of one phase of their education and moving on to another, such as those transitioning from school to tertiary education, or from tertiary education to employment, face particular challenges. Although approaches to distance learning clearly differ between primary school and higher education, the needs of skills sector programs (Arts, Technical and Vocational Education and Training) require more special attention. Digital learning has become the rule of the Covid-19 outbreak (Karp & McGowan, 2020). Universities and schools reach their students through distance education programs and open education platforms to ensure that education continues without disruption (UNESCO, 2020).

Teachers in Turkey have never experienced any outbreak or school processes that need to be rebuilt with it so far. Previous research on school closure (as an effect of government response to halt the spread of epidemic diseases), and the requirement of transitions into distance learning, has shown that schools interpret the new conditions in varied ways, indicating that officials need to prepare for transitions (Bergdahl, Bergdahl & Nouri, 2020; Klaiman, Kraemer & Stoto, 2011; Sahin & Shelley, 2020). Lederman (2020) justly stated that due to the COVID-19 crisis teachers and students both found themselves in the situation where they felt compelled to embrace the digital academic experience as the result of the online teaching-learning process.

After 9 months of online experiences, a paradigm shift has occurred in online teaching, and even after the COVID-19 pandemic, this new technological form is thought to have strong persistence. In order to integrate technology into our teaching-learning process, it is inevitable to move towards a process that allows us to teach students not only feel comfortable, but also methods by which they can meet the demands of technology in the 21st century. There are some difficulties in implementing the change process in the education system that emerged after the COVID-19 crisis, which are related to new perspectives and technological complexities of online education. Before the outbreak, online education was considered to be an educational tool provided by open universities in Turkey. But in COVID-19 induced time, online teaching-learning became a massive challenge to deal with, and stakeholders are not potentially fit to adjust with the sudden educational change as

they are not technologically competent to embrace the current situation. Therefore, for successful implementation of educational change, it is important that the shift from traditional teaching-learning methods to online teaching-learning methods is versatile and rapid (Mishra et al., 2020).

In the face of COVID-19, the shared vision of education system realized that during the pandemic period, teachers and students are motivated to adapt online teaching-learning platforms in fulfilling the current educational needs. Everyone, either teachers or students, were very quickly motivated to use the social media application. Distance education apps have become functional at all education levels as a sign of the positive learning transfer of some useful education apps and online education platforms such as ZOOM, Cisco WebEx, Google Meet Office 365, Google Classroom and much more user-friendly video conferencing apps (FutureLearn, 2020).

The information to be transferred to students in the classical education approach was presented on the pages of the book and mostly in text. Today, new information such as visuals, graphics, videos, photographs are provided to students with audio and visual support. Thus, the individual can be more active in the learning process and have the opportunity to directly access information (Pekdağ, 2005). Technological innovations are effective in all areas, one of which is education. Technology and education integration enables a more qualified education and training process. Accordingly, developed and developing countries run different projects in order to benefit more from technology in the field of education. In this context, the positive contribution of technology to education is undeniable (Akman ve Güven, 2014; Akturk & Saka Ozturk, 2019; Beard et al., 2011; Hill, & Uribe-Florez, 2020; Kara, 2020; Mutlu, Polat, & Alan, 2019; Wallace-Spurgin, 2019).

Distance education is quite different from normal education in terms of the physical presence of the student or teacher. Distance education provides more flexibility for both learners and educators. However, it can be said that distance education requires higher discipline and planning in order to successfully complete the teaching process. Thanks to the flexible planning provided by distance education, students can easily choose the courses that fit their schedule, interests and needs. Thanks to digital learning environments, students can also determine the appropriate teaching methods for them (Bradley, 2020; Perraton, 2000; Williams-Britton, 2021).

Students need to be disciplined in order to make the most of distance education. Students need to motivate themselves to follow their responsibilities, especially in systems that do not require them to be in a specific time or place. Teachers, on the other hand, need to be better organized in order to cope with unexpected situations in the distance education process. However, in some cases, distance education is not only necessary, but it is the best possible option. For example, distance education has been among the best options for many students during the pandemic. The most well-known advantages of distance education can be listed as follows (Bates, 1995).

Education faculties (Department of Music Education) provide 4-year undergraduate education aimed at training music teachers to institutions that provide education at public and private primary and secondary education levels. Students who will study at the specified faculty are determined by special talent exams that determine in which field of music and to what extent they are talented. The Department of Music Education program consists

of courses that include world knowledge, subject matter knowledge and pedagogical formation. Education and training lasts 4 years, and lessons are taught both theoretically and practically (Önder, 2014). Thanks to piano education, people who receive music education acquire the musical knowledge they need to acquire with their own education on the one hand, and the piano playing skill that is necessary in music education and training that begins in pre-school and continues at higher education levels on the other hand (Hamond, 2013). Therefore, it can be said that this training covers a long and complicated process. In this process, it is extremely important to teach students to behave in a planned, conscious, continuous, and at the same time executed manner from the first lesson (Bresin & Battel, 2000).

Individualization is a key concept in the design of instruction. Individual differences are important in music education. For this reason, when designing a teaching system, it should be designed by considering individual differences. The aim of individualized instruction is to shape the learning environment or learning content according to the individual‟s needs. Instructional systems, which aim to provide individualized learning environments, emerge as a sub-field in the field of advanced learning technologies in this context. It is included in the literature under the name of “Individualized or Adaptive Instruction”. When examined in terms of design and implementation features, individualized instruction is in the common field of the disciplines of Educational Technology, Computer Science and Artificial Intelligence.

Besides, when examined in terms of art education, it is seen that today‟s e-learning systems are insufficient in terms of providing education according to individual differences and learning objectives (Doğru, 2020; Kaleli, 2020). Existing e-learning systems hold the student highly responsible for the realization of the learning activity. Instruction offered by e-learning systems may fail due to different learning styles and different learning abilities of individuals, different cognitive levels related to the subject they are trying to learn, different learning needs, different preferences regarding the learning environment and different learning objectives. Adult e-learning students can more easily control the psychological factors associated with learning. However, in general, e-learning students may fail to realize their own learning using e-learning systems (Martinez, 2002). For this reason, e-learning systems with more individualization capability are needed.

It is a proven fact that piano education, which is one of the most important dimensions of musical education, contributes effectively to other musical elements of the individual as well as playing the piano. The training performance of the individual receiving education is directly proportional to the level of piano playing (Napoles et al., 2017). Using supportive teaching materials throughout piano education and applying them to the teaching process leads to a more efficient learning process. Therefore, the educator can teach efficiently and effectively using contemporary teaching technologies in the piano lesson (Kaleli, 2020).

Technological-pedagogical content knowledge is the knowledge of using technology, pedagogy and content in the same context at the same time. TPACK is defined as follows: dynamic, procedural integration knowledge between technology, pedagogy and content, and how this interaction affects student learning in the context of the classroom (Uygun, 2013; Cox, 2008). In the literature, TPACK is defined as a critical knowledge base that should be developed by prospective teachers (Angeli & Valanides, 2005). Developing and implementing

successful teaching requires understanding how technology relates to pedagogy and content (Koehler et al., 2007; Koyuncuoğlu, 2021). Although the factors that affect the process of integrating educational technologies are multidimensional, planning and implementation of teaching methods related to the use of technology in music teaching is an important source of problems (Kara, 2020; Kaleli, 2020). Thus, it is thought that effective application of individualized instruction with online technologies will be effective in the process of integrating pedagogy, technology and content knowledge (TPACK) of music teacher candidates.

Answers to the following questions were sought within the framework of this purpose of the research:

- Is there a significant difference between the academic achievements of the experimental group in which online + individualized instruction practices were carried out in the piano lesson and the control group in which distance learning applications were carried out?
- Is there a significant difference between the TPACK skills of the experimental group in which online + individualized instruction practices were carried out in the piano lesson and the control group in which distance learning applications were carried out?

Method

Research Design

As can be clearly understood from the research questions, it is an experimental study. The design of the study was determined as a pre- and post-test experimental study with a control group. The sample selection and the assignment to the groups are done randomly. In this design, 2 groups of students were studied as the experimental group (15 students) and the control group (15 students). While online learning + individualized learning activities were provided to the students in the experimental group, the existing distance learning activities were offered to the students in the control group. The same content of the piano instruction program was provided in both groups and the process was carried out simultaneously for 10 weeks. The only difference between the two groups was the additional individualized instruction in the experimental group. As shown in Table 1, measurements were carried out on the variables determined in both groups, one at the beginning (pre-test) and the other at the end (post-test).

Table 1. Research Design

Groups	Pre-test	Implementation	Post-test
Experimental Group	• Piano Achievement test • TPACK skill test	Curriculum Instruction + Online instruction Individualized instruction	• Piano Achievement test • TPACK skill test
Control Group	• Piano Achievement test • TPACK skill test	Curriculum Instruction + Online distance instruction	• Piano Achievement test • TPACK skill test

The Participants

Experimental and control groups were formed in accordance with the principles of the control group pretest-posttest model, which investigated the effects of online supported individualized instruction conducted in piano lessons in the department of music teaching, on students‟ TPACK skills and achievement. For this purpose, students in Necmettin Erbakan University Music Education Department (n=30) were randomly assigned to the experimental and control groups. These students were classified according to their gender, and then they were assigned to two different groups randomly. In total, there were 18 female and 12 male students in the class. 9 girls and 6 boys were assigned to group 1 and 9 girls and 6 boys to group 2 by random assignment. Then, these two groups were randomly assigned as experimental and control groups. The university entrance scores and piano playing skills of the students were similar. In the department, piano lessons were conducted by the researcher in all groups.

Experimental Procedures

The following experimental procedures were carried out in this study, which investigated the effects of online supported individualized instruction carried out in piano lessons in the department of music teaching on students‟ TPACK skills and achievement. The reliability and validity of the tests and scales to be used in the study were tested. This study included experimental and control groups. Music lesson achievement test and TPACK scale were applied to both groups as a pre-test. The implementation was carried out simultaneously on the same day. In the experimental group, a program was designed according to the principles of online learning and individualized curriculum, the content of which was determined according to the piano lesson course contents determined by Council of Higher Education. In this context, “studies of C major and A minor tones starting from one octave scale up to four octave, recognition of major and minor tones, studies of other major and minor tones, cadence studies and their practice, staccato and legato techniques applied on short works, examination of finger and performing studies and exercises that will help strengthen the wrists, singing school songs with accompaniment, phrasing and sight-reading exercises in piano, and works on musicality” were conducted online for 1 hour a week and face-to-face activities were carried out with an individualized instruction method for 1 hour. Individualized face-to-face teaching application was carried out for each student individually by the instructor. Therefore, online and face-to-face teaching activities were conducted simultaneously in the experimental group. During the face-to-face piano teaching practices, the students repeated the pieces and carried out practice activities. At this stage, the works to be played were written with the student on the Finale program and the MIDI application was used to speed up/slow down the pieces during the piano study. Within the scope of the arrangements made in the work, Rhythm Detection, Melody Detection, Nuance Detection, Speed , Tone, Syncope, Prolongation, Legato, Staccato, Portato applications were performed with the Finale program. By using the Music Animation Machine (MAM) program, the written notes were transformed into visual elements and supported with colorful graphics according to the note periods and parts of the works.

Finally, feedback-correction activities were carried out by the instructor about the students‟ performances. In the

control group, the same content was conducted via Zoom program for 2 hours with a distance learning approach. In the experimental group, online supported individualized instruction activities were applied while in the control group distance education activities were conducted sychronously. The implementation took place within the framework of the instruction of the curriculum for 10 weeks and 20 hours. After the experimental procedures, piano lesson achievement test and TPACK scale were applied as post-test to both groups. The application was carried out simultaneously on the same day.

Data Collection Tools

TPACK Scale

The scale developed by Kaya and Kaya (2013) to measure TPACK self-efficacy perceptions of teachers and teacher candidates was used as data collection tool in the study. The scale consists of 47 items and 7 sub-dimensions. The developed scale is 5-point Likert type and the options range from "1-I don't know" to "5-I know very well". Along with the Cronbach alpha reliability coefficients, the relevant sub-dimensions are as follows: Content Knowledge (0.83), Pedagogical Knowledge (0.89), Technology Knowledge (0.84), Technology Content Knowledge (0.90), Pedagogy Content Knowledge (0.76), Technology Pedagogy Knowledge (0.91) and Technology Pedagogy and Content Knowledge (0.89). The reliability coefficient for the overall scale is 0.92. Confirmatory factor analysis was performed during the scale development process, and the factor loads of the scale items ranged from 0.37 to 0.83. Test-retest reliability of the scale was 0.82. The reliability coefficients of the data regarding the sub-dimensions of the scale were found as CK (0.883), PK (0.892), TK (0.905), TCK (0.896), PCK (0.798), TPK (0.874), TPACK (0.829). The Cronbach alpha reliability coefficient for the overall scale was 0.862. Considering that the expected reliability coefficient for data tools that can be used in studies is 0.70, it is seen that the reliability level for the TPACK scale is high.

Piano Lesson Achievement Test

An achievement test developed by Kardeş and Eğilmez (2017) was used to measure the pre-service music teachers" piano lesson acquisition. The process of item preparation, item identification and selection of the measurement tool was performed by the researchers with the help of expert opinions. In order to ensure the validity of the achievement test, the opinions of the expert faculty members were taken and then subjected to item analysis. As a result of KR20 analysis, the reliability coefficient of the test was found as 0.894. An achievement test consisting of 32 items was developed. As a result of the analysis, the item difficulty index values (pj) of the 32 items were between 0.18-0.75 and the item discrimination index values (rjx) were between 0.32 and 0.74. Item discrimination index value has an important place especially in achievement tests. This value is required to be above 0.30 (Yılmaz & Sünbül, 2003). Based on these findings, it can be argued that all items of the piano education achievement test had a highly distinctive structure.

Data Analysis

In this process, the effects of the methods applied in the context of the data obtained at the end of the

experimental procedures of the research on students‟ piano success and TPACK skills were examined. The quantitative data obtained were analyzed using the SPSS package program. Since the data did not meet the normal distribution assumptions (Yurt and Sünbül, 2012), the Mann Whitney U test, one of the non-parametric tests, was used in the pre-test and post-test scores of the experimental and control groups.

Findings

Table 2 shows the results of the Mann Whitney U test performed on the pretest TPACK scores of the students in the experimental and control groups. According to the analysis, the z-values found in all dimensions of the TPACK scale of the two groups were not significant at the 0.05 significance level. Thus, there is no significant difference between the pre-test TPACK skills of the experimental group which received online learning + individualized instruction before the experimental procedures and the control group which received the distance education.

Table 2. Comparison of TPACK Pre-Test Scores According to Research Groups

	Group	N	Mean Rank	Sum of Ranks	z	p
Pre_CK	Experimental	15	15.70	235.50	-.12	.90
	Control	15	15.30	229.50		
Pre_PK	Experimental	15	13.77	206.50	-1.09	.28
	Control	15	17.23	258.50		
Pre_TK	Experimental	15	17.40	261.00	-1.19	.23
	Control	15	13.60	204.00		
Pre_TCK	Experimental	15	15.50	232.50	.00	1.00
	Control	15	15.50	232.50		
Pre_TPK	Experimental	15	17.23	258.50	-1.11	.27
	Control	15	13.77	206.50		
Pre_PCK	Experimental	15	18.13	272.00	-1.64	.10
	Control	15	12.87	193.00		
Pre_TPCK	Experimental	15	17.33	260.00	-1.15	.25
	Control	15	13.67	205.00		

Table 3 shows the results of the analysis performed on the pre-test piano lesson academic achievement scores of the students in the experimental and control groups. According to statistical analysis, a z-value of 1.58 was calculated between the pre-test total scores of the two groups. It revealed that there is no significant difference between the pre-test piano lesson achievement scores of the experimental and control groups at the beginning of the study. In terms of the academic achievement in the piano lesson, it was found that the experimental group receiving online learning + individualized instruction and the control group receiving distance learning application were similar.

Table 3. Comparison of Piano Lesson Pre-test Achievement Scores According to Research Groups

	Group	N	Mean Rank	Sum of Ranks	z	p
Pre-test	Experimental	15	13.00	195.00	-1.58	.11
Achievement	Control	15	18.00	270.00		

Table 4 shows the results of the analysis performed on the post-test TPACK scale scores of the students in the experimental group which received online learning + individualized instruction and the students in the control group which received distance education. According to the analyzes performed with the Mann Whitney U test, there were significant differences between the groups in terms of PK, TPK, PCK and TPCK dimensions of the TPACK scale ($p<0.05$). Regarding these dimensions, the students in the experimental group, in which online learning + individualized instruction was performed, obtained higher post-test scores. However, there was no significant difference between the groups in the CK, TK and TCK dimensions of the TPACK scale. Therefore, it can be argued that the combination of face-to-face education and online instruction leads to a significant increase in students‟ PK, TPK, PCK and TPCK.

Table 4. Comparison of TPACK Post-test Scores According to Research Groups

	Group	N	Mean Rank	Sum of Ranks	z	p
CK	Experimental	15	16.73	251.00	-.44	.66
	Control	16	15.31	245.00		
PK	Experimental	15	20.30	304.50	-2.58	.01
	Control	16	11.97	191.50		
TK	Experimental	15	15.83	237.50	-.10	.92
	Control	16	16.16	258.50		
TCK	Experimental	15	18.17	272.50	-1.40	.16
	Control	16	13.97	223.50		
TPK	Experimental	15	22.67	340.00	-4.04	.00
	Control	16	9.75	156.00		
PCK	Experimental	15	19.80	297.00	-2.30	.02
	Control	16	12.44	199.00		
TPCK	Experimental	15	19.67	295.00	-2.19	.03
	Control	16	12.56	201.00		

Table 5 shows the results of the analysis performed on the students‟ post-test piano achievement test scores in the experimental group in which online learning + individualized instruction was given and the students in the control group in which distance education was offered. According to the analszes performed with the Mann Whitney U test, a Z value of 2.64 was calculated between the two groups. This shows that there was a significant difference in favor of the experimental group in terms of piano education posttest achievement test scores. The students in the experimental group who received online learning and individualized instruction achieved significantly higher scores than the students in the control group.

Table 5. Comparison of Piano Test Post-test Achievement Scores According to Research Groups

	Group	N	Mean Rank	Sum of Ranks	z	p

Post-test	Experimental	15	19.67	295.00	-2.64	.01
Achievement	Control	15	11.33	170.00		

Discussion

Students in the experimental group (interactive learning environment organized according to individualized online learning) were more successful in the piano lesson as a result of the experimental procedures than the students in the control group (the learning environment that provided interaction design in distance learning). In the experimental group, while the students gained the target behaviors of the synchronous interaction tools, they also completed their learning individually through face-to-face interactions. It can be concluded that using these two features (distance + face to face) together, which is the factor that separates the activities in the control group from those in the experimental group, contributed to students‟ learning. The application of both distance education and face-to-face teaching together provided a high positive effect on the achievement and skills of the students in piano lesson in the experimental group. Therefore, it can be argued that using different teaching approaches together in the technology platform makes students more successful in reaching the goals of the course. As a result, it can be concluded that, in piano lessons, students‟ synchronous and asynchronous interactions during learning and working with their teachers individually in this process positively affected students‟ academic achievement. It can also be stated that this result is consistent with the results of the studies (Chen & Caropreson, 2005; Güneş & Yalın, 2017; Levine, 2007) pointing to the importance of using both synchronous and asynchronous interactions in online learning. Especially a correct, conscious and systematic musical education provided to music teacher candidates during their school life in their faculties will have positive effects on their cognitive success and in direct proportion to their academic career throughout their teaching life. It is expected that students will be more active and exhibit high performance in their lessons if their individual characteristics are taken into account in the learning-teaching processes and all activities are supported by technology.

According to Zawacki-Richter and Anderson (2014), the main purpose of individualized instruction is to bring each student to the learning goals set for him or her. Activities in an individualized learning environment provide quick learners with the opportunity to go beyond specific and restrictive lesson subject concepts, while allowing slow learners to determine their own line of learning in activities that they cannot perform in crowded classes. In this respect, students who acquired the skills of the piano lesson with online processes repeated, deepened and made the content meaningful with an interactive approach through face-to-face individualized instruction method. These findings support the findings of the studies conducted by Dori and Sasson (2008), Kraus et al. (2004), and Robb et al. (2015). In one aspect, the application of individual instruction methods provide the independence of the student and the specialization of learning while online education also activates the social interaction process as a group activity. Thus, these two methods combine individual and group learning activities in a versatile and rich environment. Many studies have pointed out the importance of one-to-one teaching activities carried out under the guidance of teachers during daily practice (Akbulut, 2013; Pirgon, 2013). In addition, one of the most important factors in the positive and steady progress of the piano playing process, which is both a mental and a physical activity, is that learners‟ regular and daily work. Therefore,

individualized exercises and repetitions performed both in online instruction practices and in the implementation of the current curriculum led to a significant increase in students‟ achievement in piano playing skills in the experimental group.

Conclusion

The findings of this study show that online and face-to-face individualized instruction in piano education is more effective than routine distance learning. Based on these findings, it is argued that holistic teaching practices that integrate technology, pedagogy and content areas in schools that train music teachers will be effective. This study has the opportunity to create positive and effective change in the field of music teaching with TPACK. First, this study provides data to support a greater emphasis on TPACK in undergraduate music education. In this respect, this emphasis will contribute to the interest of music education stakeholders in TPACK competencies.

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