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Development and Evaluation of a Software Program Specifically Designed for Music Courses Within the Framework of Primary Education Curriculum

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Abstract

This study aims to analyze the effect of computer-aided instruction on the 4th-grade primary school students' achievement, attitude, and retention in music courses. It employs a pretest-posttest control group design. For ethical purposes, informed consent forms were obtained from the primary school affiliated with the Ministry of National Education Directorate in Afyon. Turkey. The study participants are 11 female, nine male students in the control group, ten male, and ten female students in the experimental group. A computer-aided teaching software was developed for the experimental group to contribute to the 4th-grade music course implementations within the scope of the curriculum. A total of 9-hour instruction was carried out for both groups. Data were collected through achievement tests and a primary school music course attitude scale. Mann Whitney U Test and Wilcoxon Signed Rankings Test were used to comparing the groups' achievement test and attitude scale scores. The findings revealed that computer-aided teaching in the experimental group was more effective in students' success and attitude toward music courses. Also, computer-aided teaching practices were found to be more effective in student retention.

Keywords: Music education, Computer-assisted learning, Education software, Academic success, Music lesson attitude, Experimental research design.

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Introduction

The place of music and music education is considered very important in the cognitive, affective, and psychomotor development of the individual. In this respect, music has been one of the most important parts of educational activities from ancient times to the present and has been used as an essential tool in shaping human behavior. Today, music teaching activities in different education levels, such as primary school, secondary school, high school, and university, are delivered to young generations with compulsory and elective courses (Tarman, 2006; Yağışan & Sünbül, 2009).

The inadequacy of traditional teaching has led to educational scientists' research and implementation of new approaches. Because the "information society" demands alternative approaches to traditional teaching (Koyuncuoglu, 2021; Yalın, 2002; Yılmaz & Sünbül, 2002). In the century we live in, the accuracy value of information changes in a short time. In order to keep up with this change, it is necessary to train creative thinkers instead of individuals with template thinking skills. In addition, there are individual differences in education. The way each student acquires musical knowledge and skills may differ. In this regard, it is recommended to use different methods and techniques in music teaching at primary and secondary school levels (Sünbül, 2004).

Computer-assisted teaching in education; It has been stated that students have a positive effect on their learning speed and creative thinking skills. Thanks to technological applications in music education, different kinds of information can be blended, and different cultures can interact with each other in the digital world. Visual and audio materials can be used as a whole with such applications. This way, it is possible to reach musical goals easily for a short time. Making music lessons easily applicable with computer-aided teaching applications and integrating and interacting with existing teaching processes will make significant contributions to this field (Baş, Kubiatko, and Sünbül, 2016; Sarıkaya, 2022).

The inadequacy of traditional teaching has led to educational scientists' research and implementation of new approaches. Because the "information society" demands alternative approaches to traditional teaching (Kara, 2021; Sünbül, 2000). In the century we live in, the accuracy value of information changes in a short time. In order to keep up with this change, it is necessary to train creative thinkers instead of individuals with template thinking skills. In addition, there are individual differences in education. The way each student acquires musical knowledge and skills may differ. In this respect, it is recommended to use different methods and techniques in music teaching at primary and secondary school levels. Teachers should discover the best learning methods for students and choose and use appropriate teaching techniques for effective learning (Doğru, 2020; Kilincer, 2022).

Thanks to the developing technologies and digital equipment in education, it has become straightforward to write notes, vocalize, compose, arrange, develop music software, share musical information, develop musical information, and share all kinds of comments and information about music. Developing and widespread use of keyboard and synthesizer instruments brought a new perspective to music education and musical performance. In addition, the discovery of MIDI (Musical Instrument Digital Interface), which enables musical instruments to communicate and work in harmony with each other, has significantly contributed to individual and group studies

in the field of music. In music education, new methods have been discovered with the development of software that serves the purpose of teaching activities. Today, new developments are recorded in music education every day due to technological developments (Koç, 2004).

Three main effects have occurred in the design of instructional technologies (Knirk & Gustafson, 1986). The first of these; is related to the fact that the teaching aid materials used while teacher-centered should focus on the materials that students will use predominantly. Distance education and lifelong education approaches make it more valuable and beneficial to design instructional technologies students will use to learn. Technological developments and developments in the knowledge we acquire about learning are the other two main effects on the design of instructional technologies (Alan and Sünbül, 2010; Kaleli, 2021).

Computer-assisted instruction can be defined as the whole of activities in which the learners interact with the lessons and activities designed in the computer environment during the learning-teaching process, where the teacher plays the role of a guide, and the computer plays the role of a rich environment and platform (Sünbül, Gündüz & Yılmaz, 2002). All the above elements are necessary for computer-assisted teaching applications to reach their goals. However, when we look at the factors affecting computer-assisted teaching practices and processes, we can see that innovations, student motivation, individual learning differences, interaction, quality and scope of course software, teacher's readiness for computer-assisted education, perception, attitude, changing role, attitudes and course content. It is seen that it includes various variables such as its integration with the education program and the way the computer-aided education application is transformed into practice within the school framework (Sünbül, 2010; Şahin and Yıldırım 1999; Sendogdu & Koyuncuoglu, 2022).

In computer-assisted teaching, the computer does not take the teacher's place. The computer allows the teacher to create interactive learning environments in the classroom environment. It is possible to benefit from computer applications by using different methods in the teaching process. The primary purpose of computer-assisted teaching is to help increase the quality of learning (Assylzhanova et al., 2022; Bayrak, 2005; Kaleli, 2021). Computer-assisted instruction uses educational computer software as a teaching tool. This teaching process helps to create individual learning-teaching processes. This way, students can plan their learning processes at their own pace. Studies have revealed that computer-assisted instruction has many benefits that affect students, teachers, and the teaching process. Computer-assisted instruction creates a safe environment for learning to take place. It helps students meet their individual needs. It delivers rich information resources to students (Rıza, 1997).

Computer-assisted teaching is a broad approach that includes different methods and techniques. Depending on this situation, the researchers aimed to examine the computer-aided methods in more detail by gathering them under different headings. Computer-assisted teaching methods include computer-aided tests, interactive multimedia and hypermedia environments, and intelligent teaching systems. The most commonly used software type in computer-assisted teaching is special tutorial programs. In special tutorial programs; repetition, trial, practice, and measurement-evaluation activities are given importance (Demirci, 2003; İşman, 2003; Yılmaz and Sünbül, 2003).

Unique instructional program designs are prepared by teaching principles and methods. The teaching process is planned step by step, based on behavioral, cognitive, and constructivist teaching approaches together. Special training programs; It can be said that there are educational programs that teach the subject like a teacher, provide practice opportunities, motivate students toward the lesson, and provide feedback by evaluating student success (Gürol, 2004; Kaya, 2005; Uşun, 2000; Yalın, 2001).

The use of music technology in music education is an ongoing process: On the one hand, it is entirely dependent on the achievements of the science/technology community; On the other hand, it is a process that requires a progressive mentality change in a society where many processes and techniques remain very traditional. The development of new music teaching systems faces many challenges. Music educators must now ensure that their administrators understand that music should be part of their plans to use computers in school. The arts have been a powerful driver in the development of new technologies, and when our students apply their musical skills and inquiry to computer applications, they develop all-around skills as they develop computer skills. Using BBL in the Arts, especially in music education, unleashes the imagination and encourages students to master the skills that learning as a computer processor is much more powerful. In addition, the multimedia environment provides awareness of music and sound abilities and the development of visual literacy. There seems to be a considerable gap between what technology and digitization can provide today and the extent to which technology is used in music education. Digitization in music education is discussed extensively among research institutions, teaching institutions, music academies, and music education associations. However, there is little progress in how digitization is widely applied in real teaching situations today (Crawford, 2009; Savage, 2009).

The inadequacy of traditional music teaching has led to the research and implementation of new approaches by music educators. In addition, there are individual differences in music education. The way each student acquires musical knowledge and skills may differ. In this respect, it is recommended to use computer-assisted teaching methods and techniques in music teaching at primary and secondary school levels. In this research context, is there a significant difference between the achievement, attitude, and permanence of the students in the groups in which computer-assisted teaching (experiment) and current teaching programs are applied in primary school fourth-grade music lessons? Within the framework of this purpose of the research, answers were sought to the following questions:

1. Is there a significant difference between the achievement pre-test results of the experimental and control groups?
2. Is there a significant difference between the attitude pre-test results of the experimental and control groups?
3. Is there a significant difference between the achievement post-test results of the experimental and control groups?
4. Is there a significant difference between the attitude post-test results of the experimental and control groups?
5. Is there a significant difference between the permanence test results of the experimental and control groups?
6. Is there a significant difference between the experimental group's achievement post-test and pre-test results?
7. Is there a significant difference between the achievement post-test and pre-test results of the control group?

Method

Research Model

of computer-assisted teaching applications applied in primary school fourth-grade music lessons on students' achievement, attitudes, and permanence of what were learned were investigated. The research was carried out in the pretest-posttest model with a control group, one of the actual experimental models. According to Karasar (2002), it is vital to fulfilling three rules inaccurate trial models. In this context, there are at least two groups, experimental and control, in the design created for the actual trial model, the pre-test is applied at the beginning of the applications, and the post-test is applied at the end. In addition, the assignment of subjects to the experimental and control groups is done by random method. In this study, computer-assisted music education in the experimental group and the current fourth-grade music education program were applied in the control group. Since the effect of experimental practices in music lessons on students' achievement, attitude, and permanence of what has been learned was investigated, achievement and music lesson attitude scales were applied to the research groups as a pre-test in the study. As the other rule of the real trial model, the same scales and tests were applied to the subjects as post-test and retention tests at the end of the application.

Research Sample

Experimental and control groups were formed per the principles of the control group pretest-posttest model in this study, in which the effects of computer-assisted teaching applications applied in primary school fourth-grade music lessons on students' achievement, attitudes, and attitudes, and permanence of what was learned was investigated. For this purpose, necessary permissions were obtained to implement the research in a primary school affiliated with the Afyon Provincial Directorate of National Education. One branch (n=40) with an even number of students from the three classes in the school was determined for random assignment to the experimental and control groups. There are twenty-one female and ninety male students in the class. Eleven female and nine male students were randomly assigned to group 1, and ten female and ten male students to group 2 by random assignment. Then, these two groups were assigned as the experimental and control groups by random method. In the final stage, eleven girls and nine boys were in the control group, and ten boys and ten girls were in the experimental group. The parents of the children studying in the classroom within the scope of the research have similar socioeconomic and educational statuses. Classroom teachers conduct music lessons in all classes at the school. The proximity to the postgraduate institution of the research, the motivation of school administrators and teachers to conduct the research, the school's necessary support in experimental practices, and the positive attitude and interest in art in the school were influential in determining this school as a research center.

Experimental Process

The following experimental procedures were carried out in this study, in which the effect of computer-aided teaching applications applied in primary school fourth-grade music lessons on students' achievement, attitude, and permanence of what was learned was investigated.

1. Computer-aided instruction software was developed to be applied in the experimental group. For this purpose, a music lesson educational software program has been developed that contributes to implementing the fourth-grade music lesson acquisitions following the primary school curriculum. In this context, a plan was prepared that exemplifies the content related to 2 learning outcomes from the 'Let's Create Rhythm and Tune' learning area, three outcomes from the 'Different Rhythmic Structures' learning area, and finally one outcome from the 'Let's Dance' learning area, and transforms it into an activity. Then, a courseware draft was prepared that represents and exemplifies the relevant learning areas and achievements appropriate to the readiness level of the children, attracting their attention and motivating them to the activities. At this stage, the opinions of 1 primary school music teacher, one academician with a doctorate in music education, one instructional technologist, one computer programmer, and one expert in the education programs and teaching field were consulted.

The software was developed by having these prepared plans and drafts coded by a software company. After the field experts examined the developed software, the software was finalized with the feedback and correction suggestions made to the software company. This software consists of two stages. The first stage is screening animated films aimed at making students comprehend the acquisitions in the related learning area. The second stage is to test the content gained by the animation demonstration for the relevant learning area through the game. Animation demonstration aims to gain students' subjects related to the relevant learning field, measure how much they gain these subjects, and increase their motivation. In addition, the software company created the Android version of the game stage. In this way, students reinforced what they learned by playing games outside the classroom. In the development of computer-assisted teaching software, the principles and instructions of the fourth-grade music lesson curriculum and the activities' explanations were taken into account.

2. Testing the reliability and validity of the tests and scales to be applied in the research. In this context, the primary school music lesson attitude scale and fourth-grade music lesson achievement test were developed, and their reliability and validity were tested before the research.

3. Formation of experimental and control groups. At this stage, a group of students studying at the fourth-grade level of primary school was assigned as the trial and control group according to the criteria of the accurate trial model.

4. Music lesson achievement test and attitude scale were applied to both groups as a pre-test. The application was carried out simultaneously on the same day.

5. Computer-Aided Music Education in the Experimental Group and the current fourth-grade music education program in the control group were applied simultaneously. The implementation took place in 9 hours within the framework of the instruction of the curriculum. At this stage, a teacher's guidebook prepared according to the principles of the current fourth-grade music lesson curriculum was applied to the control group.

6. Music lesson achievement test and attitude scale were applied to both groups as post-test after experimental procedures. The application was carried out simultaneously on the same day.

7. After the experimental applications, no procedure was performed in both groups for 15 days.

8. Finally, the music lesson achievement test and the attitude scale were applied to both groups as a post-test 15 days after the experimental procedures. The application was carried out simultaneously on the same day.

Research Instruments

In this study, in which the effect of computer-aided teaching applications applied in primary school fourth-grade music lessons on students' achievement, attitude, and permanence of what has been learned, primary school music lesson attitude scale and fourth-grade music lesson achievement test were used to collect the necessary data.

Achievement Test

In the research, an achievement test was developed to be used in the fourth-grade music lesson's pre-test, post-test, and retention measurements. For this purpose, first of all, the learning area and achievements of the fourth-grade music lesson, which is the basis for preparing the computer-assisted curriculum for the experimental applications of the research, were examined. At this stage, the music lesson curriculum and united annual plans prepared by the Ministry of National Education were taken as the basis. In this context, a table of specifications was prepared that exemplifies the content related to 2 acquisitions from the 'Let's Create Rhythm and Tune' learning area, three acquisitions from the 'Different Rhythmic Structures' learning area, and finally, one acquisition from the 'Let's Dance' learning area. Then, multiple-choice questions representing and examining the relevant learning areas and acquisitions were prepared.

The opinions of a primary school music teacher, one academician with a doctorate in music education, and one assessment and evaluation expert were consulted. Based on expert opinions, a total of 20 questions were prepared consistent with the achievements of the fourth-grade music lesson. This way, the content validity of the whole test and each item was ensured. Then, these questions were formed with four options, taking into account the age and class characteristics of the target group to which the research will be applied. According to Özçelik (2013), creating an order with four options is essential, taking into account the readiness of children for multiple-choice tests in the primary school curriculum. The developed 20-question multiple-choice fourth-grade music lesson achievement test was applied to a group of 144 students in May 2018. In selecting this group, the criteria of studying in the 4th grade and achieving these gains in the lessons were considered.

Item and test analyze were made on the data of the fourth-grade music lesson achievement test, which was tested. As item analysis, pj-item difficulty index, rjx-item discrimination index, and sj-item statistics of each item in the test were calculated. According to the analysis, it was seen that 20 items of the fourth-grade music lesson had difficulty between 0.45 and 0.86. According to Özçelik (2013), it is stated that tests consisting of items with medium difficulty will give more reliable results in achievement test applications for research purposes. It was observed that the music achievement test developed for the study consisted of items of medium difficulty. In the

second stage of the test development, each item's item discrimination index was calculated. This index is distinctive and essential in distinguishing between those who have and those who do not. According to Turgut (1992), item discrimination should ideally have a coefficient above 0.30 in achievement tests. According to the analysis, it was seen that the discrimination indices of all the items of the primary school fourth-grade music lesson developed for the study were above 0.30. Thus, an achievement test consisting of items with medium difficulty and high distinctiveness features was obtained. The final stage in the development of the fourth-grade achievement test was the procedures performed to ensure the reliability of the test as a whole. According to Turgut (1992), KR-20 Internal Consistency Coefficient is the most appropriate method for reliability in tests scored 1-0, especially in exams that measure success. This technique was preferred because it gives an effective reliability coefficient by considering each item and the test's total score in an application. According to the item and test analysis, the KR-20 reliability of the primary school fourth-grade music lesson achievement test was calculated as 0.82. This finding shows that the test developed to measure the related achievements of the students in the fourth-grade music lesson has a high internal consistency and reliability. After these calculations, the final version of the Primary School Fourth Grade Music Lesson Achievement Test was created.

Primary School Music Lesson Attitude Scale

The scale developed by Özmentaş (2006) was used to measure the attitudes of primary school fourth and secondary school fifth grade students towards the music lesson. There are 20 items, 8 of which are negative and 12 of which are positive, on the scale of attitude towards primary school music lessons. In the scale where the Likert-type rating system is applied, a respondent gets points between 20 and 100. High scores obtained from the scale indicate positive attitudes and tendencies towards music lessons, while low scores indicate negative attitudes and tendencies towards music lessons. New approaches applied in music lessons must develop positive attitudes towards this field in students. This is also among the general objectives of primary school art classes (Mullins, 1984: 17).

The trial application of the primary school music lesson attitude scale was carried out on 144 students. The exploratory factor analysis technique was used to test the construct validity of the Primary School Music Lesson Attitude Scale. The scale results are KMO=0.983 and Barlet Test=1893.514 ($p<0.01$) according to the procedures performed with Varimax Exploratory Factor Analysis. These values show that the scale is suitable for factor analysis in representing the relevant structure, and the study group is suitable for the scale. Due to its Eigenvalue (Eigenvalue), the 1-dimensional scale has a high explanatory level with a variance value of 52.44%. The Scree Plot graph showed that the elementary school fourth-grade music lesson attitude scale has a one-dimensional structure. It was observed that each item of the scale had a factor load of over 0.45 with its unidimensional structure. These findings show that the primary school fourth-grade music lesson attitude scale has high validity.

The Cronbach Alpha method was used to test the reliability of the primary school music lesson attitude scale, and the analysis result was calculated as 0.95. In addition, it is seen that the correlation coefficients between the items of the scale and the total scores are above 0.588. These data show that all items and the whole scale measure attitudes towards music lessons in a distinctive way. These findings reveal that the primary school music course

preferred to be used in the research has high validity, reliability, and consistency.

Data Analysis

In this study, in which the effect of computer-aided teaching applications applied in primary school fourth-grade music lessons on students' achievement, attitude, and permanence of what has been learned, was tested, the Shapiro Wilk test was applied to test the suitability of the research data to the normal distribution. Non-Parametric Statistical Techniques were used in the study because some data did not meet the normal distribution assumptions. The research data were arranged in Excel 10.0 program, and all statistical operations were carried out in SPSS 22.0 program.

Results

Table 1. Comparison of Pre-Experimental Achievement Test Scores of Experimental and Control Groups

Variable	Group	N	Mean Rank	Sum of Ranks	U	Z	p
Pre achievement test	Experimental	20	20.83	416.50			
	Control	20	20.18	403.50	193.50	-0.177	0.862
	Total	40					

When the Table 1 is examined, there is no statistically significant difference between the achievement test pre-test scores of the experimental group, in which the BDI practices are applied in the music lesson, and the control group, in which the current applications in the music education program are performed ($p>0.05$). According to this result, it can be said that the music lesson success levels of the fourth-grade students in the experimental and control groups before the experimental procedure are equivalent to each other.

Table 2. Comparison of Experimental and Control Groups' Pre-Experimental Attitude Scale Scores

Variable	Group	N	Mean Rank	Sum of Ranks	U	Z	p
Pre attitude test	Experimental	20	18.10	362.00			
	Control	20	22.90	458.00	152.00	-1.312	0.201
	Total	40					

When Table 2 is examined, there is no statistically significant difference between the attitude scale pre-test scores of the experimental group in which the BDI practices are applied in the music lesson and the control group in which the current practices in the music education program are performed ($p>0.05$). It can be said that the positive attitudes of the fourth-grade students in the experimental and control groups towards the music lesson were at a similar level before the experimental procedure.

Table 3. Comparison of the Experimental and Control Group's Post-Experimental Achievement Test Scores

Variable	Group	N	Mean Rank	Sum of Ranks	U	Z	p
Post achievement test	Experimental	20	27.73	554.50			
	Control	20	13.28	265.50	55.50	-3.935	0.000
	Total	40					

When Table 3 is examined, there is a statistically significant difference between the achievement test post-test scores of the experimental group, in which the BDI applications are carried out in the music lesson, and the control group, in which the current applications in the music education program are performed ($p<0.05$). After the experimental procedure, it was observed that the fourth-grade students in the experimental group increased their music lesson achievement scores more. This result indicated that the BBL practices in the experimental group were more effective in increasing the success of fourth-grade students in music lessons compared to the current curriculum in the control group.

Table 4. Comparison of the Experimental and Control Groups' Post-Experimental Attitude Scale Scores

Variable	Group	N	Mean Rank	Sum of Ranks	U	Z	p
Post attitude test	Experimental	20	26.65	533.00			
	Control	20	14.35	287.00	77.00	-3.345	0.001
	Total	40					

When Table 4 is examined, there is a statistically significant difference between the attitude pre-test scores of the experimental group, in which the BDI practices are applied in the music lesson, and the control group, in which the current applications in the music education program are performed ($p<0.05$). After the experimental procedure, the experimental group students increased their attitude test scores more. This result showed that the BBL practices applied in the experimental group contributed more to the fourth-grade students' positive attitudes towards the music lesson compared to the music teaching program applied in the control group.

Table 5. Comparison of the Retention Test Scores of the Experimental and Control Groups

Variable	Group	N	Mean Rank	Sum of Ranks	U	Z	p
Retention Test	Experimental	20	26.55	531.00			
	Control	20	14,45	289,00	79.00	-3.292	0.001
	Total	40					

When Table 5 is examined, there is a statistically significant difference between the permanence test scores of the experimental group, in which the BDI practices were performed in the music lesson, and the control group, in which the current practices in the music education program were performed ($p<0.05$). This result showed that CBL practices were more effective in ensuring the permanence of what was learned than the fourth-grade music

curriculum.

Table 6. Comparison of the Experimental Group's Achievement Test Scores Before and After the Experimental Procedure

Group	Variable	Post-test- Pre-test	N	Mean Rank	Sum of Ranks	Z	p
Experimental	Achievement Test	Negative rank	20	10.50	210.00	-3.925	0.000
		Positive rank	0	0.00	0.00		
		Ties	0				
		Total	20				

When Table 6 is examined, there is a statistically significant difference between the mean achievement test scores obtained from the experimental group of students in the music lesson before and after the experimental procedure ($p<0.05$). The achievement test scores obtained from the experimental group students after the experimental procedure were significantly higher than those obtained after the experimental procedure. This result indicated that the CBL activities applied in the music lesson effectively increased the fourth-grade students' success.

Table 7. Comparison of the Control Group's Achievement Test Scores Before and After the Experimental Procedure

Group	Variable	Post-test- Pre-test	N	Mean Rank	Sum of Ranks	Z	p
Control	Achievement Test	Negative rank	14	10.29	144.00	-1.982	0.047
		Positive rank	5	9.20	46.00		
		Ties	1				
		Total	20				

When Table 7 is examined, there is a statistically significant difference between the achievement test pretest-posttest scores of the control group students to whom the music education program was applied ($p<0.05$). The achievement test scores obtained from the experimental group students after the experimental procedure were significantly higher than those obtained after the experimental procedure. This result indicated that the current music education program effectively increased the success of fourth-grade students.

Discussion

In this study, the effects of computer-assisted teaching applied in primary school fourth-grade music lessons and the effects of the current music teaching program on the achievement, attitude, and permanence of the learned students in the groups were compared; significant results were obtained. As a result of the applications and analyses carried out with the first sub-problem of the research, it was seen that the students in the experimental group who applied computer-assisted music teaching achieved significantly higher post-test success than their

friends in the group in which the current program was applied. These findings are similar to the results of many studies in the literature (Aşkar and Olkun; Çelen, Çelik and Seferoğlu, 2011; Lim & Ching, 2004; Wang, Zhang, Wang & Zhang, 2017; Mills & Murray, 2000). A study conducted by Jonassen and Reeves (1996) on this subject revealed that the conscious use of computer-assisted education technology in lessons has an effective potential in realizing the achievements of the subject area and improving the quality of the lesson (Çağıltay et al., 2001).

The combination of computers and music education to provide a good learning environment to achieve predetermined teaching goals with the computer-assisted music education approach has been influential in the emergence of this result. When computers are used systematically in teaching musical composition or arrangement, musical notes, and musical instruments, students' achievements and achievements increase (Wu, 2007; Gao, 2007; Cheng, 2007). Many related studies have shown positive opinions about the results of computer-assisted music teaching (Chan, Jones, Scanlon, & Joiner, 2006; Yang, Lay, Liou, Tsao, & Lin, 2007; Lee, 2007). After the experimental procedure carried out, the experimental group students increased their achievement test scores more. This result showed that the BBL practices in the experimental group were more effective in increasing the students' success in music lessons compared to the current curriculum in the control group. In the emergence of this result, with the help of computer-aided music software, auditory and visual senses are brought together as a whole by listening, singing, and providing the opportunity to interact with stimuli over and over in the integrity of learning. In addition, various sensory organs of the students are activated through computer-assisted music teaching, and the learning effect is much better, more effective, and more affluent than using a single organ (Wang, Zhang, Wang, & Zhang, 2017). For this reason, the effectiveness and quality of music learning are significantly improved with the help of computer music software (Liu, 2016). The findings of many music lesson studies supported the findings in the first sub-problem of this research. Green (2003) examined the effects of computer-assisted education on students' guitar performance and general musical success. In addition, the effects of computer-assisted instruction on different abilities and skill groups were examined with a standardized test. The study examined the long-term effects of interactive computer-aided Guitar software. According to the research findings, although computer software is not effective in short-term applications, significant increases were observed in guitar skills and music lesson success in general when applied in a long-term and programmatic manner. In the study, it was also seen that computer-assisted music lesson applications were most successful in talented students with above-average skills.

Another study that revealed similar results to the study's findings was carried out by Glenn (2000). Glenn's (2000) mixed model study examined the effects of the Smart Music smart accompaniment program on applied oboe, clarinet, and bassoon skills at the university level. As a result of the experimental applications, when the smart companion program was used, it was observed that the students in the experimental groups performed higher than their peers in the control group. In addition, students who received oboe, clarinet, and bassoon training accompanied by computer-aided software stated that they benefited from smart accompaniment software for these qualitative questions and that these practices contributed to their musicianship.

Another finding reached in the study is that there is a statistically significant difference between the attitude post-test scores of the experimental group in which BDI was applied in the music lesson and the attitude post-test

scores of the control group in which the current MEB music education program was applied. After the experimental procedure, the experimental group students increased their aptitude test scores significantly. This result showed that the BBL practices applied in the experimental group were more effective in developing positive attitudes towards the music lesson of the students compared to the current MEB music lesson curriculum in the control group. These findings are supported by many studies in the literature (Benson, 2002; Aşkar & Olkun, 2005; Boshuizen & Wopereis, 2003; Çelen, Çelik & Seferoğlu, 2011; Lim & Ching, 2004).

It is seen that the use of information and communication technologies in educational environments increases student success and motivation, as well as contributes to the development of high-level thinking skills and positive attitudes towards the lesson (Aşkar and Olkun, 2005; Boshuizen and Wopereis, 2003; Çelen, Çelik, and Seferoğlu, 2011; Lim and Ching, 2004). Technological development, which can also be considered a product of the educational process, also changes the structure of all educational processes and brings a different perspective to practices and approaches (Tor & Erden, 2004). Different approaches, practices, exposure to active stimuli, rich content, content suitable for children's readiness, and the use of remarkable tactics and techniques with a practical music lesson software have positively affected the students' attitudes. In a similar study, Benson (2002) examined the effects of a computer-assisted instructional environment that can provide audio, video, and multimedia models on student performances and attitudes in student group piano activities. As a result of his study, the researcher found that students' attitudes towards the lesson, their interest increased, and their general affective characteristics such as self-confidence and self-concept were positively affected. According to Godwin-Jones (2013), integrating computer technology with lessons provides experiential learning, better understanding, strong interaction between students and teachers, motivation for learning, and self-study environments. Students' learning abilities and motivation can be improved by using computers and related technologies, and technology provides interactive and exciting techniques in academic courses, and computer technology positively affects students' attitudes by presenting complex content efficiently (Bahrani & Sim, 2012). In general, the use of computer technology in education has made the classroom and music lessons more attractive and exciting, and students' active participation in the lesson has increased their motivation and attitudes.

One of the findings reached in this study is the comparison of the permanence test scores of the experimental group in BDI in the music lesson with the permanence test scores of the control group to which the current curriculum was applied. The analysis of the study showed that the CBL music practices applied in the experimental group were more effective in ensuring knowledge permanence than the current music lesson curriculum in the control group. The findings reached in the current study are similar to the research findings of Barg (2009). According to Barg (2009), easiness, economy, and learners come to the forefront in dealing with priority issues in music lessons with computer-assisted teaching music education applications. These factors make the music learning process more prosperous and interactive, improving students' musical skills, performances, and performances. Similarly, a multivariate study by Jaschke, Eggermont and Honing (2013) examined the relationships between computer-assisted teaching practices in music education and academic achievement and cognitive skills.

Conclusion

According to the research findings, technologically supported enriched teaching environments and practices in music lessons positively affect academic achievement, high-level mental skills such as analysis, synthesis, multiple performances, and mental permanence.

Recommendations

According to the results of the research, the following recommendations can be made:

- With the applications carried out in this thesis, it has been observed that computer-assisted teaching applications are effective in realizing the achievements of music lessons in primary schools. In this context, examples of computer-aided teaching applications should be placed in music education programs. It forms the core of this study, which aims to realize the interaction with the instructional software and the achievements of the music lesson. In this context, the potential of the instructional software designed for the study, the use of the teacher, and the interaction between the software and students can be tested with different studies. In this context, it is suggested that research and development of music lesson teaching software should focus on the effects of the interaction between the software and students.
- This research, in which the effects of computer-assisted teaching in music lessons in primary school fourth grades are tested with experimental methods, can be supported by qualitative research methods.
- Even if there is a well-produced software in the music lesson, it may not be sufficient for teaching alone. Therefore, creating a warm atmosphere in the classroom and good interaction between teacher and students will be the key to successful computer-assisted teaching.
- Regarding the standards of computer-aided music lessons, teachers need to have basic knowledge, skills, and attitudes that can both use technology, integrate it into their fields, and organize the school and classroom environment in a way that learners can use. In this context, it is recommended to include computer-aided music teaching courses in teaching programs that train music teachers.

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