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REVIEW

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Açık Erişim

## Mobile Applications in Musical Instrument Education: A Systematic Review of Literature

Çalgı Eğitiminde Mobil Uygulamalar: Literatürün Sistematik Bir İncelemesi

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### ABSTRACT

This research is a qualitative study that aims to examine the academic research in the field of mobile applications in instrumental education scanned in Google Scholar, Web of Science (WoS), and Education Resources Information Center (ERIC) database. The document analysis method was used as the research model. Searching the keywords “violin app and musical instrument and violin application”, the study included 16 academic studies. The academic studies were analyzed in terms of imprint, year, country, research methods, and data collection tools. The analyzed data were tabulated and interpreted. The findings were compared with the literature, and recommendations were made.

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### ÖZ

Bu araştırma, Google Scholar, Web of Science (WoS) ve Education Resources Information Center (ERIC) veri tabanlarında taranan çalgı eğitiminde mobil uygulamalar alanındaki akademik araştırmaları incelemeyi amaçlayan nitel bir çalışmadır. Araştırma modeli olarak doküman analizi yöntemi kullanılmıştır. Çalışmaya “ViolinApp ve musical instrument ve violin application” anahtar kelimeleri ile taranan 16 akademik çalışma dâhil edilmiştir. Akademik çalışmalar künye, yıl, ülke, araştırma yöntemleri ve veri toplama araçları açısından analiz edilmiştir. Analiz edilen veriler tablolaştırılmış ve yorumlanmıştır. Elde edilen bulgular literatürle karşılaştırılmış ve önerilerde bulunulmuştur.

### Article Information

#### Keywords

Violin application,  
Violin education,  
Mobile violin education

#### Anahtar Kelimeler

Keman uygulaması  
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**Etik Bildirim:** This article does not require an ethics committee decision as it is a review.

## Introduction

"If your goal is one year ahead, plant seeds. If it is ten years from now, plant trees. But if it is a hundred years from now, educate the people. Because once you plant a seed, you get a crop once. Once you plant a tree, you get a crop ten times. But when you educate a society, you get a hundred times the harvest." (Başaran, 2003, p. 1). The fact that these words spoken by the Chinese bard Kuan Tzu in 1000 B.C. are still literally valid today shows how important education has been throughout human history. Education is derived from the Latin word "educare", which means "to raise", "to grow", "to develop" (Keyifli, 2013, p. 196). Throughout history, many definitions have been made for education, and many approaches have been adopted. One of the most inclusive definitions made in recent history has been made by Declory as "the act of adapting to a life and environment in which the needs and abilities of the person to be educated are monitored and fulfilled day by day" (Karşlı, 2012, p. 4). Although music education, which is one of the indispensable parts and feeders of contemporary education, has been defined by many educators, the most valid definition is accepted as basically, the process of gaining a musical behaviour, changing a musical behaviour or creating a change in musical behaviour, developing a musical behaviour, that is, the process of developing desired behaviours in musical behaviour through the individual's own experience with the help of the basic components that make up music (Çuhadar, 2016, p. 221; Uçan, 1997, p. 10). Music education supports the development of academic and personal skills such as critical thinking, problem solving, and learning how to work collaboratively for these purposes, and although comprehension skills such as how to use symbols, analyse, synthesize, and evaluate information are not fully evident in music education, it strengthens the development of the child's skills in this direction (Şendurur & Barış, 2002, p. 167). Music education is divided into three categories according to its scope and aims. These are general music education, amateur music education, and vocational music education. "General music education is necessary for and aimed at everyone, regardless of their relationship with music. Vocational music education is for those who have a high level of musical talent and who choose music as a job, profession, serious or permanent occupation, field of duty or field of study. On the other hand, amateur music education is for those who have a special interest, desire, and predisposition to music and choose music as a hobby" (Uçan, 1997, p. 7-8). In Türkiye, in addition to general and vocational music education, amateur music education, which is gaining importance, is carried out in different institutions such as music courses, private lessons, choirs and public education centre courses where different musical genres and instruments are taught (Özdek, 2006, p. 9). In the institutions that provide private instrument training, the training of various instruments is carried out in a wide range from string instruments to wind instruments, percussion instruments to traditional instruments in order to appeal to people with different tastes (Tokatlı & Mustul, 2021, p. 6598). This type of music education does not have a teaching program or a clear scope. The teacher is free to determine the scope according to the student's goal, ability, interest, and work intensity. The most widespread step of amateur music education is instrument training. Especially for younger age groups, amateur instrument training is offered in almost every school, in music houses in all neighbourhoods, and in state-sponsored courses. This situation requires different teaching and motivation methods in this type of education, which is not compulsory. Instrument teachers who want to keep up with the changing age have to try different methods to reach today's children and to realize instrument education. Classical teaching methods, which were valid until the 90s and 2000s, are no longer useful for Generation Z and Alpha generation individuals who were born in the digital age and have adopted the identity of digital self-expression. Although the goals of instrument

education are the same as in the past, the process of reaching the student and realizing the education completely changes. At the beginning of instrument training, the goals have always remained the same, and these have been “correct posture, correct holding of the instrument, correct holding of the hands on the instrument’s keyboard, learning the keys completely, learning the note and stop values, and the necessary terms such as speed and nuance” (Ercan, 2008, p. 52). However, methods such as demonstration and one-way lecturing, which are very successful in the education of Generation X and Y individuals, do not reach today’s students and cause a lack of motivation. The quality and momentum of instrument training depend on the systematic study process of the student between the two lessons, beyond the fact that the teacher and the student have a lesson for one hour one day a week. Since muscle development is important, students need to repeat their homework daily and train their muscles. Especially in the beginning education, the students’ inability to produce quality sound from their instruments and to create a melody creates a very negative situation for the home studies aspect of instrument education.

With the widespread use of digital technologies in all areas of our lives, the way students learn is also changing. This change in learning processes brings along situations such as fast access to information and the ability to make entertainment-learning environments through digital environments. All these changes make it necessary to keep up with the digital age. The dynamic, visual, and interactive methods that Generation Z and Generation Alpha, also defined as digital natives, turn to in their learning processes emphasize the importance of digitalization in education and have made the use of technology-based teaching methods in education undeniable (Parlak, 2017). The FATİH Project, launched in 2010 in Türkiye, is a comprehensive transformation project that aims to digitalize education by distributing tablets and computers to students, enabling teachers to track homework on digital platforms, and integrating information and communication technologies into education (Ekici & Yılmaz, 2013). It would be possible to say that the project paved the way for the use of digital technologies in educational processes, though it was terminated after a while.

When digitalization is considered in terms of instrument education, it provides significant benefits in terms of both making learning processes more effective and increasing students’ motivation. Considering the decreasing effectiveness of traditional methods for today’s children, it is important for teachers who teach instrument education to adapt to these new technologies and developments. This adaptation process requires teachers to turn to digital tools (Korkutan, Efşin & Yurday, 2024)

Considering the use of digital tools, mobile applications and music software increase students’ motivation in and out of class, while creating a comfortable and fun learning environment for students (Suvorov et al., 2022). In addition, in processes where face-to-face education cannot be provided, such as the COVID-19 pandemic, the continuity of education has been ensured with music software and online programs in the field of music (Camlin & Tania, 2021). Digital platforms used in instrumental education can also contribute to learning the basic objectives, such as instrument playing and note reading skills required in education. In addition, mobile applications have positive effects in terms of contributing positively to the student-teacher relationship, enriching the education process, and facilitating the understanding of the content (Daponte et al., 2010). While programs and applications such as Nkoda, ForScore, FlipFolder, and Newzik are used for note reading (Eryılmaz & Kılıç, 2024), piano-oriented applications such as Perfect Piano, Simply Piano, and Garage Band (Arslanhan & Eğilmez, 2023) are used. When looking at the applications for learning to play the violin, applications such as Violin by Trala, and Violy Learn & Practice Violin Music are encountered (Kürün

& Ayhan, 2024). Looking at the years of the studies, it is seen that studies in the fields of mobile applications and instrument education have become more frequent in recent years. This increase is important in terms of systematically examining and compiling the existing literature on instrument education and digitalization in order to understand the current situation and to benefit future studies.

In line with all this information and purpose, the problem statement of the research was determined as “What are the characteristics of academic research published on mobile applications in instrument education?”. On the basis of this main problem, answers to the following sub-problems were sought:

1. What are the genres (thesis, article, etc.) of academic research about mobile applications in instrument education scanned in Google Scholar, (WoS) and ERIC database?
2. What is the yearly distribution of the academic research on mobile applications in instrument education scanned in Google Scholar, WoS and ERIC databases?
3. What is the distribution of the academic research on mobile applications in instrument education scanned in Google Scholar, WoS and ERIC databases according to the countries in which they were written?
4. What is the distribution of the academic research on mobile applications in instrument education scanned in Google Scholar, WoS and ERIC databases according to methodology?

## Method

In this section of the study, information on the research model, the population and sample, the data collection process and the analysis of the data obtained are given.

### Research Model

According to Creswell (2021), investigating and comprehending the meaning that people or groups assign to a social or human issue is known as qualitative research. In qualitative approaches, where the researcher collects and interprets the data and utilizes fields such as case study and phenomenology, data can be obtained from both interviews and documents. The research model is a case study, one of the qualitative research methods. Case studies are studies that aim to reach conclusions about a specific situation or to investigate more than one situation in depth. In case studies, it is expected that “the results obtained regarding a situation will create examples and experiences for understanding similar situations” (Yıldırım & Şimşek, 2018).

### Data Collection

The universe is the inclusive group consisting of living or non-living beings from which the data necessary to answer the questions being researched are obtained. Sampling, on the other hand, refers to the process of selecting samples that will represent a certain part selected from the universe in order to determine the characteristics of the universe and the processes carried out in this process (Büyüköztürk et al., 2016, pp. 80-81).

In this research, academic studies written in the field of instrument education scanned in Google Scholar, WoS, and ERIC databases constitute the population of this research. The reasons for choosing these databases are that Scholar is the largest database, WoS contains the most up-to-date and most qualified studies in the field of technology, and ERIC covers the use of technology in education. The databases were searched with the keywords “violin app and musical instrument and

violin application” and 20 academic studies were reached. While the population of the study was determined as 20 studies, 4 studies were not included in the study due to access barriers. Thus, the sample of the study consists of 16 academic studies. Simple random sampling method was used to determine the sample of the study. In simple random sampling method, all sampling units can be preferred at the same rate and all units in the universe have independent/equal chances in selection (Büyüköztürk et al., 2016).

## Data Analysis

Document analysis was used in the research, which aims to examine academic studies in the field of instrument education scanned in Google Scholar, WoS and ERIC databases. Sönmez and Alacapınar (2019, p. 109) define document analysis as “the collection and examination of written and visual material”. The academic studies included in the sample were categorized based on the sub-problems of the research as genre, years of publication, countries where they were written, and methodology distribution of academic studies.

In this study, which aims to examine the academic research on mobile applications in instrument education, content analysis of the studies accessed by document analysis method was conducted. The main purpose of content analysis is defined as “to reach concepts and relationships that can explain the collected data” (Yıldırım & Şimşek, 2018).

In order to analyze the academic research accessed from the databases, an “academic research review form” was created by the researchers. While creating this form, similar studies were reviewed, and data collection tools were examined. The academic research review form included the years of the studies, the countries in which they were written, methodology, and topics.

## Findings

In this part of the study, the findings and interpretations obtained from 17 academic studies searched with the keywords “mobile app and musical instrument and violin application” in Google Scholar, WoS, and ERIC databases are presented.

**Table 1.** Academic Studies Reviewed

| Research No | Title   | Author  | Year of Publication |
|-------------|---|---|---------------------|
| 1           | Serious game using augmented reality for supporting the education process of the violin                       | Eleftheria Siklaidou  | 2021                |
| 2           | Violin Virtuoso: A game for violin  | Linda Hill  | 2012                |
| 3           | Creating a Teaching and Learning Experience for Designing Interactive Applications                            | Szu-Ming Chung & Chun-Tsai Wu   | 2017                |
| 4           | On digitising the Greek music tradition: simulation of the Cretan lyre for mobile                             | Dimitrios Margounakis & Georgios Tsotakos<br>Andreas Floros                                   | 2020                |
| 5           | Monophonic Guitar Synthesizer via Mobile App  | Edgar García Leyva; Ruiz Ledesma, Elena Fabiola; Rosaura Palma Orozco; Lorena Chavarria Báez. | 2021                |
| 6           | Interactive piano Learning Systems: implementing the Suzuki Method in web-based                               | Jing Qiu Sun  | 2022                |
| 7           | An AI Piano Tutor   | Lin Yuyang; Ma Zhiying; Wang Ximing   | 2021                |
| 8           | Examining the software used in mobile devices in terms of piano education                                     | Burcu Kalkanoğlu; Çağla Serin   | 2018                |
| 9           | Engaging students in creative music making with musical instrument application in an online flipped classroom | Davy T. K.; Ellen H. L.; Samuel K. W.   | 2022                |

|    |   |   |      |
|----|---|---|------|
| 10 | Learning Malaysian Musical Instrument through Interactive 2D Games            | Nurul Hidayah Ishak; Masyarah Zulhaida Masmuzidin       | 2021 |
| 11 | Violin Tutor  | Richard John Hirst                                      | 2016 |
| 12 | A study on educational software development through gamification in guitar    | Tuncay Aras; Ajda Aylin Can                             | 2023 |
| 13 | Digital Gamification in Private Music Education                               | Carolyn Wagner  | 2017 |
| 14 | VR Orchestra App: Violin Prototype for Desktop                                | Jocelyn Dunkley   | 2020 |
| 15 | Educational Software for Gamification Method in Instrument (Guitar) Education | Tuncay Aras   | 2020 |
| 16 | Game-Based Learning of Musical Instruments: A Review and Recommendations      | Margoudi & Duarte de Oliveira, Manuel, Waddell & George | 2016 |

### Findings Regarding the Distribution of Genres

In this sub-problem of the research, the findings related to the genres of academic research are given.

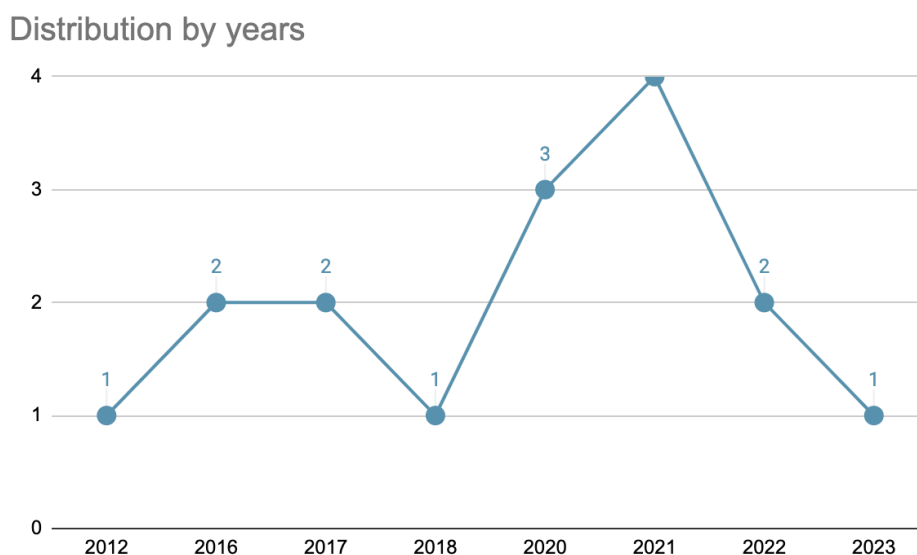
**Table 2.** Distribution of the Genres of the Academic Research on Mobile Applications in Instrument Education

|                 |   |
|-----------------|---|
| Article         | 9 |
| Thesis          | 4 |
| Project         | 2 |
| Full-Text Paper | 1 |

As can be seen in the table, articles constitute the majority of the research. It is seen that 9 of the studies are articles, four are theses, two are graduation projects, and one is a full text paper.

### Findings Regarding the Yearly Distribution

In this sub-problem of the research, the findings related to the years of publication of the academic research in the field of mobile applications in instrument education that were scanned in Scholar, WoS, and ERIC databases are included. The data are shown in Chart 1.



**Chart 1.** Distribution of academic research on mobile applications in instrumental education according to the years of publication

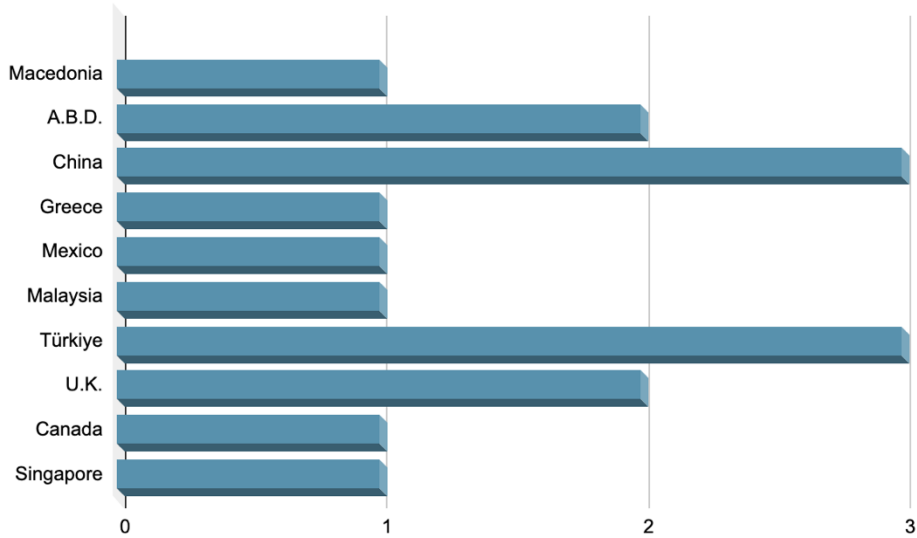


When Chart 1 is examined, it is seen that the academic studies written in the field of mobile applications in instrument education were written between 2012 and 2024. The number of studies written in this field did not exceed 6 until 2018, and after 2018, it started to increase.

It is seen that there is an increase in academic studies after the pandemic; 2020, 2021, and 2022 stand out as the years with the most academic studies in the field of mobile applications in instrument education.

### Findings Regarding the Countries of Publication

In this sub-problem of the study, the findings related to the countries in which the academic research on mobile applications in instrument education were written are included. The data are shown in Graph 1.



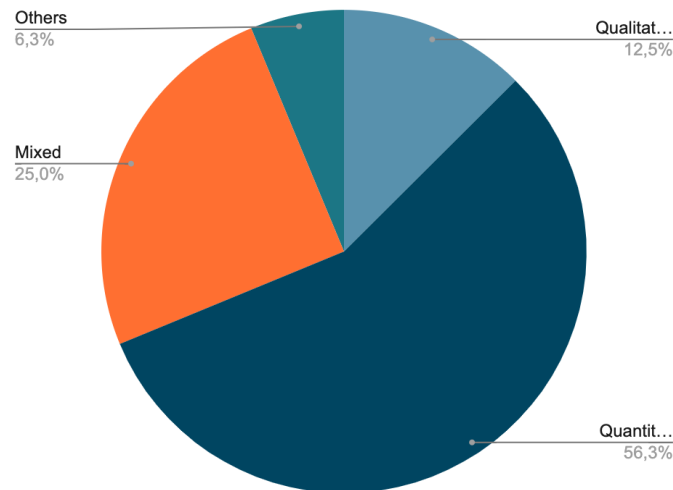
**Graph 1.** Distribution of the academic research on mobile applications in instrumental education according to the countries where they were written

Examining the countries that produce publications in this field, the country that produces the most articles on mobile technologies in instrument education is China. The intensity of academic studies on mobile applications in music education in China can be interpreted in relation to the country's investments in digital education, the use of digital tools in music education, and its large population. China is followed by Türkiye, the United States and the United Kingdom. Studies in other countries, on the other hand, appear to be more limited.

### Findings Regarding the Methodology

In this sub-problem of the research, the findings related to the research methods and data collection tools of the academic research written in the field of mobile applications in instrument education are given.

According to Graph 2, two qualitative research methods, nine quantitative research methods, and five mixed methods were utilized in 16 articles. In one of the studies, a literature review was conducted; research on the use of game-based learning in violin learning were examined, and recommendations were presented.



**Graph 2.** Methodology distribution of academic studies

**Table 3.** Methodology Distribution of Academic Studies on Mobile Applications in Instrumental Education

| Education                       |   |
|---------------------------------|---|
| Design and Development Research | 7 |
| Observation                     | 1 |
| Survey                          | 4 |
| Experimental                    | 3 |
| Interview                       | 1 |
| Literature Review               | 1 |

In one study, data were collected through both design and development and interview methods.

As seen in Table 3, the most common method of data collection in published academic studies was design and development research (7). Survey (4) and experimental (3) data collection processes were the second and third most frequently used methods in data collection tools.

## Discussion, Conclusion and Recommendations

In this study, academic studies on mobile applications used in instrument education were systematically analysed. A total of 17 academic studies were examined and categorized according to genres, years, countries, and methodology. Considering the findings of the study, it is seen that there is a significant increase in the number of studies mobile applications in musical instrument education in 2021 and after. Suvorov et al. (2022), in their study on the use of mobile applications in the field of music education, showed that studies on mobile applications tended to increase. These two studies were parallel in terms of their results.

Majority of the studies examined within the scope of the present research were articles (10 articles) and the smallest part was papers (1 full text paper). Yıldız et al. (2020) examined the studies on mobile learning and found that the research on mobile learning was predominantly published as articles. According to Hung and Zhang (2012), the number of articles in the field of mobile learning is increasing. It is thought that the high number of articles among academic studies may be related to the fact that they are shared faster on academic publication platforms, reach more people and are scanned in different databases. This reveals the increasing interest of researchers in mobile applications and the



need for publications in this field. It shows that mobile applications and technologies are becoming increasingly important in terms of academic research.

Looking at the yearly distribution of studies on mobile applications in instrumental education, the findings show that the number of studies has increased rapidly after 2018. This increase can be attributed to the restrictions imposed by the COVID-19 pandemic on face-to-face education and the increasing tendency towards digital tools. Camlin and Lisboa (2021) pointed out that the pandemic accelerated digitalization in music education. In addition, Hamut (2021) underlined in his study that digitalization has made a leap in the field of education after the COVID-19 pandemic. Irwanto et al. (2023) revealed in their study that mobile learning increased in higher education between 2002 and 2022 and peaked in 2021. Hamut (2021) reveals that research on mobile applications in Türkiye has increased significantly compared to the early 2000s. Similarly, the study by Nysveen, Pedersen, and Skard (2015) emphasizes that academic research on mobile applications has shown a steady increase between 2000 and 2013. Fombona, Pascual-Sevillano, and González-Videgara (2017) stated that academic studies on mobile learning and augmented reality were frequently conducted in 2015-2016. This shows that the pandemic has increased digitalization in education. Instrumental education has also been affected by this digitalization process and the pace of studies in this field has increased.

When the results of the research are analyzed and the distribution by countries is examined, it is seen that China, Türkiye, the USA and the UK are the countries with the most studies in this field. Göksu (2021) examined academic studies on mobile applications in his bibliographic study and concluded that the countries with the highest number of academic publications are from Taiwan, the USA, China, the UK, and Spain. This situation can be explained by the importance given to digitalization by Taiwan, the U.S.A. and China depending on the policies of the countries, the projects and financial support in this field. To illustrate, in 2018, Chinese President Xi Jinping emphasized the importance of science and technology for his country and stated that they want to make China a world leader in technology (CRIOOnline, 2023).

In Taiwan, the Taiwan E-Learning Research Center (Taiwan e-Learning and Digital Archives Program, n.d.) and the National Taiwan University of Science and Technology Projects (National Taiwan University of Science and Technology, n.d.) have increased the number of academic studies in the field of mobile learning. In the U.S., projects such as the Connected Learning Initiative (Connected Learning Initiative, n.d.) and Digital Promise (Digital Promise, n.d.) have increased the number of academic studies in the field of mobile learning and also contributed to moving forward in international academic rankings. It is seen in the research conducted by Osman (2021) with the keywords mobile learning, e-learning, learning systems, students, m-learning that China stands out as the leading country in mobile learning. In another study conducted by Gupta, Kumar and Gupta (2017) in the field of mobile learning, 12024 global publications were analyzed. When the results of the study are examined, it is seen that the USA ranked first in the largest global publication share, China ranked second, and the UK ranked third. This reveals that the digitalization policies of countries affect academic studies in the field of mobile learning. Investments in educational technologies provide academic visibility to countries in a global context by increasing academic studies. These investments in digitalization also serve as an incentive for other countries to work in this field. On the other hand, the fact that China stands out as the country with the highest number of studies may be associated with having the largest population in the world.

When the reviewed academic studies were analyzed in terms of research methods, it was found that design and development research and quantitative methods were mainly used in the

studies. In terms of data collection tools, surveys, and experimental studies were used to a great extent. This shows that mobile application development and research on user experiences are given importance. Hunowu et al. (2024) found that qualitative research methods were mainly used in mobile learning applications and user experiences were included. Yıldız et al. (2020) examined 1023 mobile learning articles and it was seen that quantitative (40%), followed by mixed (18%) and literature review (13%) were mostly used in the articles examined. Kavaklı and Yakın (2019), in their study on mobile learning, concluded that the quantitative research method was used most frequently; when looking at the data collection tools used, it was concluded that scales were mostly used. The descriptive analysis method was stated as the most commonly used analysis method. This shows that quantitative methods are dominant in mobile learning research, while qualitative methods play an important role in identifying user experiences. In addition, the fact that design and development research is frequently used underlines the applied studies in this field. The use of questionnaires and scales in data collection tools shows that it is aimed at obtaining fast and effective results with a wide range of users.

Based on the findings of the present review, it can be concluded that digital education processes, which have increased with the COVID-19 pandemic, have also led to the spread of hybrid models in which face-to-face and online learning are used together. It is thought that hybrid models will be adopted more frequently and appropriately in the coming processes in areas that require practice, such as instrument education. The use of mobile learning in education will facilitate access to education for a wider audience; education with mobile applications can be customized according to the individual learning speed and needs of students. In addition, the use of augmented reality (AR) and virtual reality (VR) technologies in instrument education will make education a more interactive and productive experience. Projects and thesis studies using AR and VR technologies will contribute to interdisciplinary studies.

Investing in technological infrastructure to provide students with access to mobile applications and digital tools will accelerate digitalization in education. In regions where access to mobile tools is not possible, eliminating the problems of access to these tools and access to the internet will benefit equality of opportunity in education. On the other hand, improving the digital literacy skills of teachers and students will make education more efficient.

Teachers should provide guidance in teaching students how to use mobile technologies appropriate for their education. Teachers can integrate technology into education by providing seminars and training on the use of mobile technologies in their own fields. In addition, digital platforms where teachers can share their experiences and knowledge can support digitalization in education by providing knowledge transfer.

It is thought that using gamification in educational content to increase motivation in education will benefit education. This can enable students to develop their skills in a fun way in practice-based areas such as instrument education. Mobile applications/games that monitor and analyze learning processes can show in which areas students need support. This shows that mobile learning and using mobile tools positively affect, instrument education.

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### **Yazarların Katkı Oranı Beyanı**

Makaleye her iki yazar da eşit oranda katkı sağlamıştır.

### **Destek ve Teşekkür Beyanı**

Makale kapsamında herhangi bir destek alınmamıştır. Veriler, araştırmacıların kendi imkanları ile toplanmıştır.

### **Çatışma Beyanı**

Bu araştırmada bir çıkar çatışması bulunmamaktadır.

### **Etik Bildirim**

Bu makale, derleme türünde olduğu için etik kurul kararı gerektirmemektedir.