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Virtual and augmented reality in art and art education in Türkiye: A trend analysis

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Abstract
With the research reported on here, we aimed to determine the general trends regarding virtual and augmented reality in studies conducted in the field of art and art education in Türkiye. A search was conducted in the DergiPark Akademik database between 29 July and 16 August 2024. Considering the specified inclusion and exclusion criteria, 38 preliminary studies were identified and the titles and abstracts of these studies were examined. Thirty-one studies published between 2007 and 2024 were found to meet the criteria and were evaluated within the scope of the research. A review form prepared in Microsoft (MS) Excel was used as a data collection tool. The studies were analysed using the descriptive analysis method, and the findings were presented using graphs in line with the research questions. The results indicate that virtual reality (VR), especially non-immersive VR, has attracted more attention than augmented reality (AR) in art and art education in Türkiye. The first study was conducted in 2007, after which the studies gained momentum in 2018, with the highest interest seen in 2021 and 2022. Descriptive methods were used as scientific research method in most studies and accordingly, most of the studies did not include data collection tools and data analysis methods. Only 2 studies were conducted in the field of art education and most studies were conducted in the discipline of digital art.

Keywords: AR; art; art education; augmented reality; trend analysis; virtual reality; VR

Introduction
The increasing integration of digital technology into daily life has reshaped user experiences, making it essential for the field of education to follow these innovations closely. Virtual reality (VR), which offers computer-generated simulated environments (Wu, X 2023), and augmented reality (AR), which merges real and virtual elements simultaneously (Lampropoulos, Keramopoulos, Diamantaras & Evangelidis, 2022), have attracted growing attention in art and art education. This interest is largely driven by the multimodal, multisensory learning experiences that this technology provides, as well as the documented contributions to learning, memory, and creative and social skills development (Papanastasiou, Drigas, Skianis, Lytras & Papanastasiou, 2019).

While studies in various fields highlight the potential of immersive technology – such as the use of head-mounted VR and AR devices in medical education (Xu, Mangina & Campbell, 2021), the growing adoption of VR and AR in educational contexts demonstrating their interdisciplinary applications (Zhao, Ren & Cheah, 2023), and AR-enhanced learning supported by interactive and collaborative experiences alongside discussions of technological, pedagogical, and practical considerations for future use (Zulfiqar, Raza, Khan, Arif, Alvi & Alam 2023) – research specifically focused on arts programmes is scarce in the Turkish context. This scarcity may be attributed to faculty members' knowledge, skills, or interest in these technologies (Seçkin Kapucu & Yıldırım, 2019; Yetik, Akyüz & Bardakçı, 2020).

Global analyses indicate increasing scholarly interest in integrating VR into higher education arts curricula, as well as the emergence of new research directions (González-Zamar & Abad-Segura, 2020). Therefore, although VR and AR technology offers significant opportunities to enhance student engagement and learning, there is a clear need for more applied and experimental research in the context of art and art education.

Although Seçkin Kapucu and Yıldırım (2019) analysed VR and AR studies in Türkiye between 2010 and 2018, no trend analysis specific to art and art education was identified. Conducting such an analysis was expected to generate foundational insight that may guide the effective pedagogical and curricular integration of immersive technology. Accordingly, in this study we aimed to determine overall trends in Türkiye regarding VR and AR research in art and art education and to inform future work in the field. The study was guided by the following research questions:

- What are the conditions for including VR and/or AR technology?
- What is the distribution according to types of VR technology?
- What is the distribution across years?
- What is the distribution of scientific research methods?
- What is the distribution of data collection tools?
- What is the distribution of data analysis methods?
- What is the distribution of art disciplines?

Literature Review

Virtual reality

Virtual reality technology offers users immersive experiences within three-dimensional, interactive digital environments enriched with visual and auditory simulations, enabling diverse sensory and emotional engagement (Villena-Taranilla, Tirado-Olivares, Cózar-Gutiérrez & González-Calero, 2022:2). Immersion – central to VR – refers to the perception of physical presence in a non-physical world (Lampropoulos & Kinshuk, 2024). This perceptual conviction arises when the simulated environment appears "original" and "real", leading users to feel genuinely present within it (Freina & Ott, 2015:133–134). Such immersion typically requires head-mounted display devices, and in some cases, gloves or monitoring systems.

VR is commonly categorised as desktop VR (D-VR) and immersive VR (I-VR) (Hamilton, McKechnie, Edgerton & Wilson, 2021; Lee, Wong & Fung, 2010). D-VR, considered non-immersive, does not use a headset; instead, users interact with virtual environments through devices such as keyboards, mouses, joysticks, or touchscreens (Chen, CJ 2009; Lee et al., 2010). In contrast, I-VR employs head-mounted display devices providing 360° visuals, auditory input via headphones, and increasingly advanced controllers to create a stronger sense of presence (Freina & Ott, 2015).

VR technology offers several educational advantages: enabling interaction with otherwise inaccessible objects and events, ensuring safety by eliminating real-world risks, increasing engagement and motivation through game-based learning (Freina & Ott, 2015), accelerating learning (Rojas-Sánchez, Palos-Sánchez & Folgado-Fernández, 2023), and supporting the visualisation of abstract concepts, collaborative virtual interaction, and the development of multiple perspectives (Chen, CJ 2009).

Augmented reality

AR technology constitutes a form of virtual environment that supplements rather than replaces reality by integrating virtual images with real-world settings (Azuma, 1997). The technology merges virtual and physical elements by enriching real-world objects and spaces with layered digital information (He, Wu & Li, 2018; Ke & Hsu, 2015; Klopfer & Sheldon, 2010), thereby maintaining users' sense of presence in the real world (Ma & Choi, 2007).

Research on the educational use of AR demonstrates that this technology enhances student engagement, makes learning processes more appealing and effective, and increases motivation (Bacca, Baldiris, Fabregat, Graf & Kinshuk, 2014; Di Serio, Ibáñez & Kloos, 2013; Huang, Chen & Chou, 2016). Studies also indicate that AR can support skills acquisition, improve cognitive and psychomotor performance (Wu, HK, Lee, Chang & Liang, 2013), foster research skills (Sotiriou & Bogner, 2008), encourage discovery-based learning (Yuen, Yaoyuneyong & Johnson, 2011), provide more concrete learning experiences (Antonioli, Blake & Sparks, 2014), enhance student interaction (Dunleavy, Dede & Mitchell, 2009), and promote long-term retention (Challenor & Ma, 2019).

Theoretical/Conceptual Framework

Integrating developments in VR and AR technology into learning environments enables students to assume more active roles in the learning processes (Tekedere & Göker, 2016). Literature reviews indicate that VR and AR have been applied across diverse fields, including pre-school education (Başaran, Nacar, Nacar, Tüfekçi & Vural, 2022; Koç, 2021), special education (Alqarni, Jdaitawi & Hamadneh, 2025; Demirtaş & Yalçın, 2022), primary and secondary education (Batdı, Anıl & Tunç, 2022; Yünkül, 2022), science education (Kayalar & Baran, 2021), foreign language learning (Akçayır & Akçayır, 2016), accounting education (Koşan, 2014), general education (Akkuş, Güzel & Özhan, 2021), sports education (İmamoğlu, Erbaş & Dikmen, 2022), mathematics and geometry (Çetintav & Yılmaz, 2022), health (Hoşgör, 2022), military training (İçten & Bal, 2021), tourism (Timur & Köz, 2022), advertising (Karşu Cesur, 2022), marketing (Aytekin, P, Yakın & Çelik, 2020), fashion (Yıldız & Kozbekçi Ayranpınar, 2021), and museum studies (Aytekin, H & Koçak, 2020).

The educational relevance of VR and AR lies in the capacity to create customised learning environments, simulate real-life interaction, and accelerate learning processes by saving time (Beck, 2019). Cabero and Barroso (2016) emphasise that effectively integrating AR into educational practice requires research on AR methodology, the development of multidisciplinary materials, and the training of educators in didactic competencies. Likewise, Lege and Bonner (2020) note that AR has evolved from an emerging technology into a mainstream tool, stressing the need for educators to remain informed about technological developments and to recognise AR as applicable across disciplines rather than exclusively within technology-related fields.

Despite VR and AR research in certain art-related subfields such as fashion and museum studies, the broader field of art – particularly art education – remains underexplored. Although teachers from Türkiye and South Africa have occasionally associated VR with art metaphor (Kocasaraç & Mlotshwa, 2024), studies in art education are generally limited. Accordingly, with this research we aimed to describe the current state of VR and AR integration in art and art education and to trace the evolution of scholarly interest in

the field. To this end, a systematic review was conducted to identify existing gaps and provide evidence from the literature.

Methodology

In this qualitative study we employed a trend analysis – a type of literature review in which a transparent and reproducible method was based on predefined inclusion and exclusion criteria to produce robust, evidence-based insight (Gough, Oliver & Thomas, 2017; Hemingway & Brereton, 2009). It may also be referred to as a systematic review in which quantitative, qualitative, or mixed data are synthesised, which is particularly valuable when rapid access to reliable evidence is needed. It contributes to the field by summarising existing perspectives and research outcomes while identifying gaps for future inquiry (Serhan & Yahaya, 2022). Therefore, this method is highly beneficial for both research and decision-making on policy (University College London, 2025).

Trends can be determined by examining what people are publicly saying about issues within the field, identifying where professionals are being placed, and examining the nature of their work (Ely, Foley, Freeman & Scheel, 1992:7). A review of a selected body of literature can likewise serve this purpose, as it provides comprehensive coverage of current ideas and developments in the field, thereby establishing its present state and indicating potential future directions (Ely et al., 1992:7). Essentially, this approach follows the general principles of content analysis, employing a group of trained coders who make independent judgments about the literature under review (Ely et al., 1992:7).

In this study, a literature-based approach was employed, and the process is outlined below.

Procedure

The primary search in this study was limited to the DergiPark Academic database and the Web of Science (WOS), with scanning conducted between 29 July and 16 August 2024. DergiPark, developed by TÜBİTAK ULAKBİM to support the production of scientific knowledge and open-access dissemination in Türkiye, hosts nationally indexed journals and aims to enhance their international visibility (Aslan, 2019). Since the review focused solely on this platform, the number of eligible studies may be lower than ideal, as DergiPark does not include internationally published research. To address this limitation, we also searched the WOS – a widely respected database containing reputable scientific and social science journals (Hung & Zhang, 2012), restricted by country (Turkey/Türkiye) and topic.

Search terms, including “virtual reality”, “augmented reality”, and “art education” in Turkish and English and searches were applied to published abstracts and keywords. The DergiPark search revealed studies dating back to 2007, yielding 38 candidate publications from 2007 to 2024. Inclusion criteria required that studies addressed the use of VR or AR in art or art education, were conducted in Türkiye, employed qualitative, quantitative, or mixed methods, were reviews or compilations, and were accessible in full text. Seven studies were excluded for not meeting these criteria, including works from Spain and Macedonia, a translated study, three out-of-field studies, and one with an inaccessible full text. The WOS search produced three studies, but one was outside the scope of the study and two were conducted in Northern Cyprus, resulting in their exclusion. Ultimately, 31 studies were included in the review.

Data Collection

The data were recorded in a review form developed by us using Microsoft (MS) Excel. The form included columns for year of publication, research methodology, methods of data collection and analysis, relevant art and art education disciplines, frequency of the use of VR and/or AR technology, and the type of VR technology employed.

Data Analysis

Descriptive analysis was employed to examine the data, and the identified trends were illustrated through graphs corresponding to the study themes. Such analysis facilitated the identification of topic-related trends and provided guidance for future research (Lune & Berg, 2017; Yıldırım & Şimşek, 2018). The 31 studies were independently coded by two researchers over a period of 2 weeks, whereafter the results were compared. Inter-coder reliability, using Cohen’s Kappa, was calculated as 0.67, indicating a substantial level of agreement (Landis & Koch, 1977).

Findings

The inclusion of VR and/or AR technology in the 31 studies is presented in Figure 1.

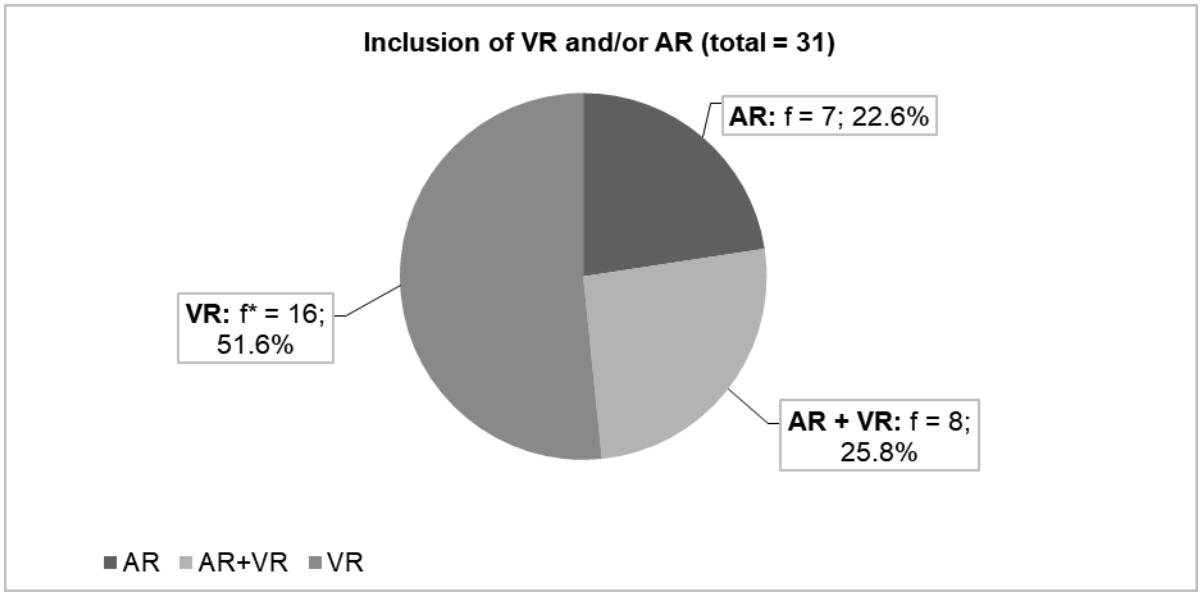


Figure 1 Distribution of studies based on inclusion of VR and/or AR technology (* indicates frequency)

As presented in Figure 1, of the 31 studies, 16 (approximately 52%) incorporated VR, seven (approximately 23%) incorporated AR, and eight (approximately 26%) included both. Twenty-four of the 31 studies included VR technology; however, no explanation was found regarding the specific type of VR technology addressed in these studies. However, based on the reviews, we grouped them as I-VR, non-immersive VR, and undefined. The findings are presented in Figure 2.

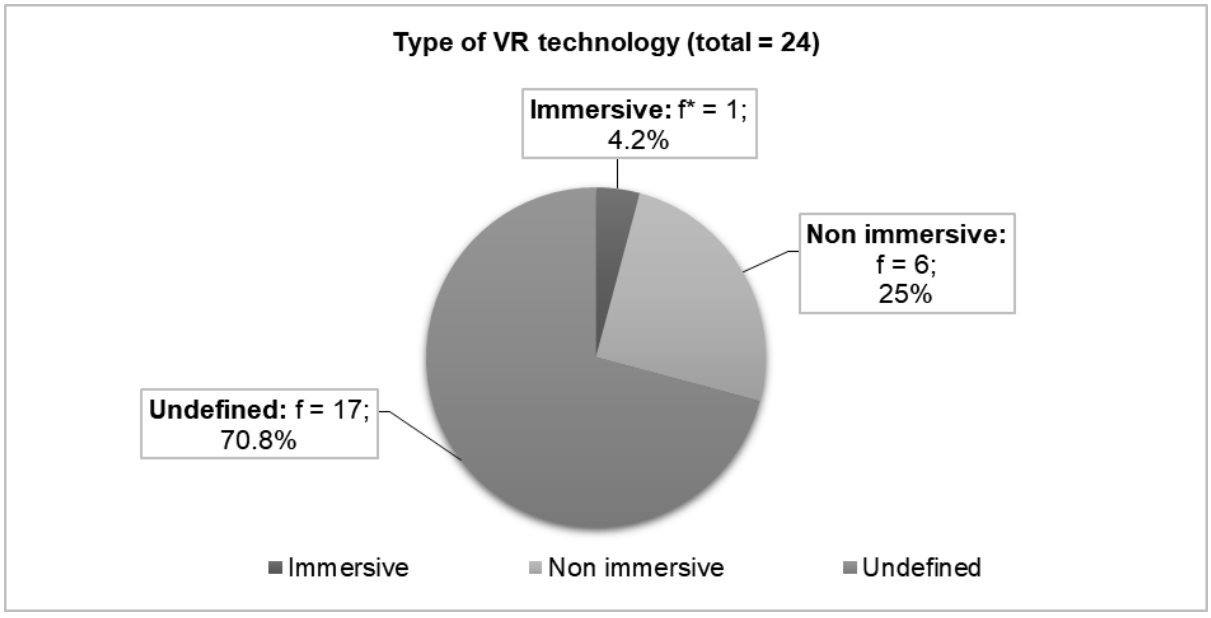


Figure 2 Type of VR technology (* indicates frequency)

As shown in Figure 2, we observed that the 17 studies grouped as undefined for VR technology were generally studies that introduced and explained applications or concepts. In the six studies that were determined to be non-immersive, VR applications that could be experienced without using any headset or VR glasses were mentioned and application examples were introduced. One study that we categorised as immersive focused on the topic of dance in a digital environment.

The distribution of 31 studies by year is presented in Figure 3.

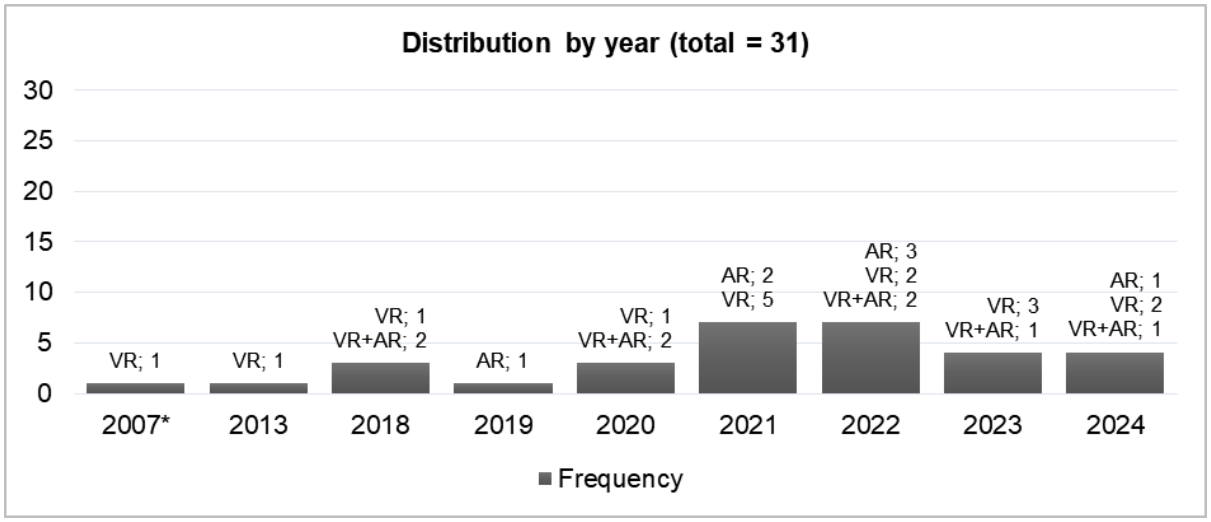


Figure 3 Distribution by year (The first year of publication was 2007, and the date of the article as included in DergiPark system in 2010)

As shown in Figure 3, the first study on VR in the field of art and art education in Türkiye was published in 2007, while studies on AR started to appear in 2018 and thereafter. No studies were found for the periods between 2007 and 2013 and between 2013 and 2018. More studies in the field were published in 2018, but interest declined in 2019, started to rise again in 2020, and peaked in 2021 and 2022, with a slight decrease in 2023 and 2024, although the number of studies was slightly above the average of the 14-year period.

We observed that 16 of 31 studies did not specify the scientific research method used. However, we concluded that 15 of the 16 studies were conducted using a descriptive method, while one study was conducted using an applied research method. This situation indicates some shortcomings in the appropriate and consistent presentation of scientific research methods in the studies in the field of art and art education included in this review. The distribution of studies according to scientific research methods is presented in Figure 4.

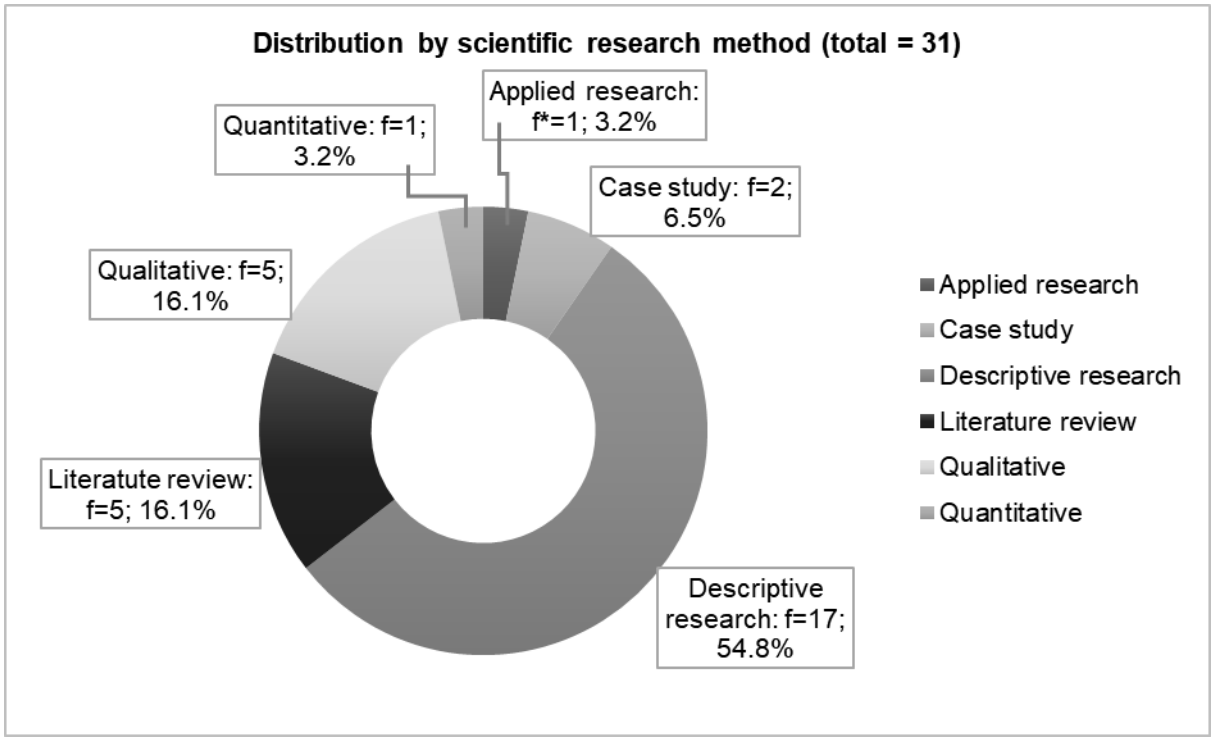


Figure 4 Distribution by scientific research method (* indicates frequency)

Figure 4 shows that studies in the field were mostly produced using the descriptive method (17) (Lin, 1976:146). We determined that quantitative research (1) and applied research (1) were the least popular methods. Methods such as the descriptive method, case studies and literature reviews are regarded as qualitative research in the education discipline.

The distribution of the data collection tools in the 31 studies is presented in Figure 5.

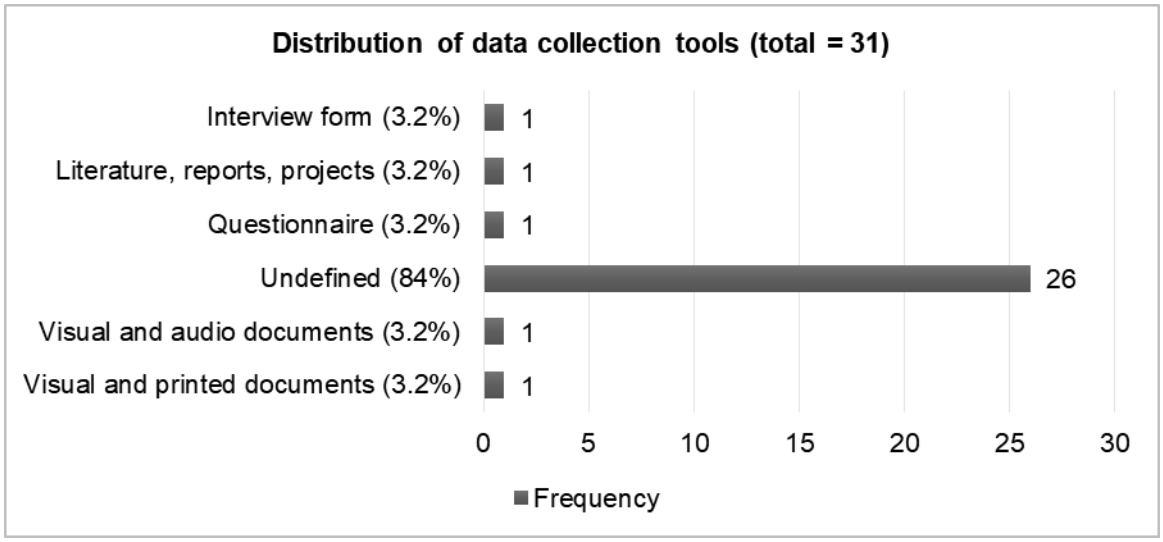


Figure 5 Distribution of data collection tools

As shown in Figure 5, the study conducted using quantitative research used a questionnaire while the qualitative research studies employed various documents such as audiovisual materials, visual-textual documents, interview forms, and literature-reports-projects. However, we observed that in some studies stated to have used qualitative methods, and in the 26 studies for which no method was specified, no data collection tools were mentioned. We may thus say that this situation is related to the deficiencies in the appropriate and consistent writing of scientific research methods.

The distribution of data analysis methods of 31 studies is presented in Figure 6.

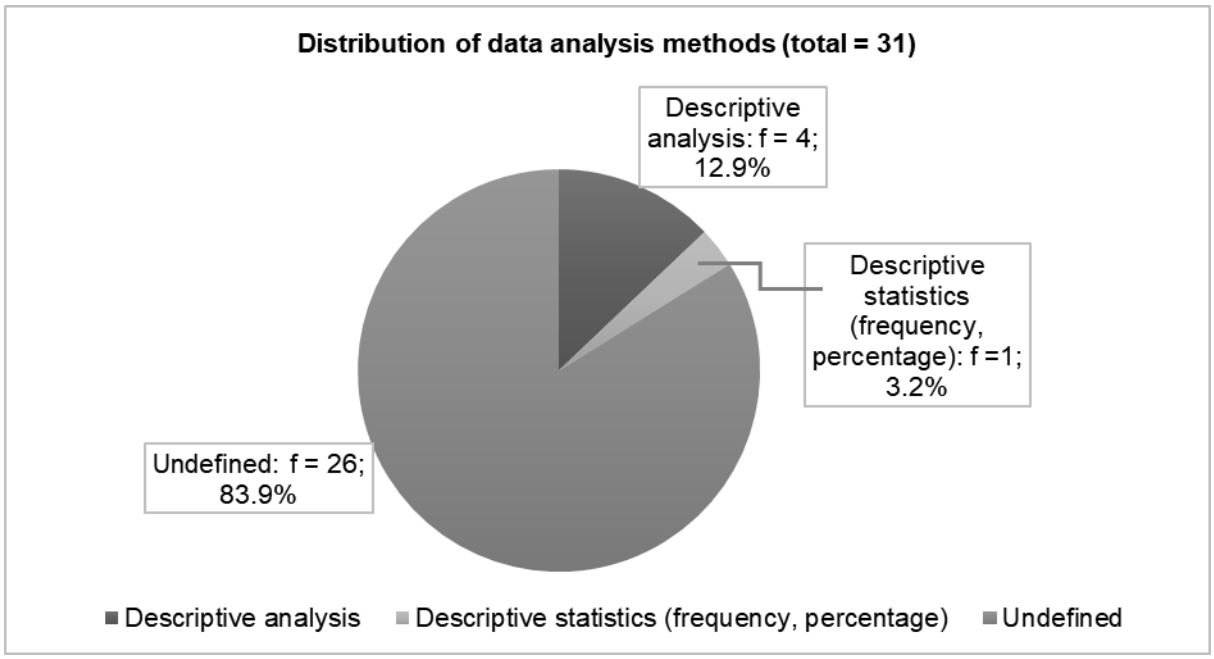


Figure 6 Distribution of data analysis methods

As shown in Figure 6, based on the findings shown in Figures 4 and 5, 26 studies did not specify the data analysis method used. We observed that four of the five studies in which the

data analysis methods were specified, descriptive analysis was used while descriptive statistics (frequency, percentage) was used in one study.

The distribution of 31 studies according to art disciplines and art education is presented in Figure 7.

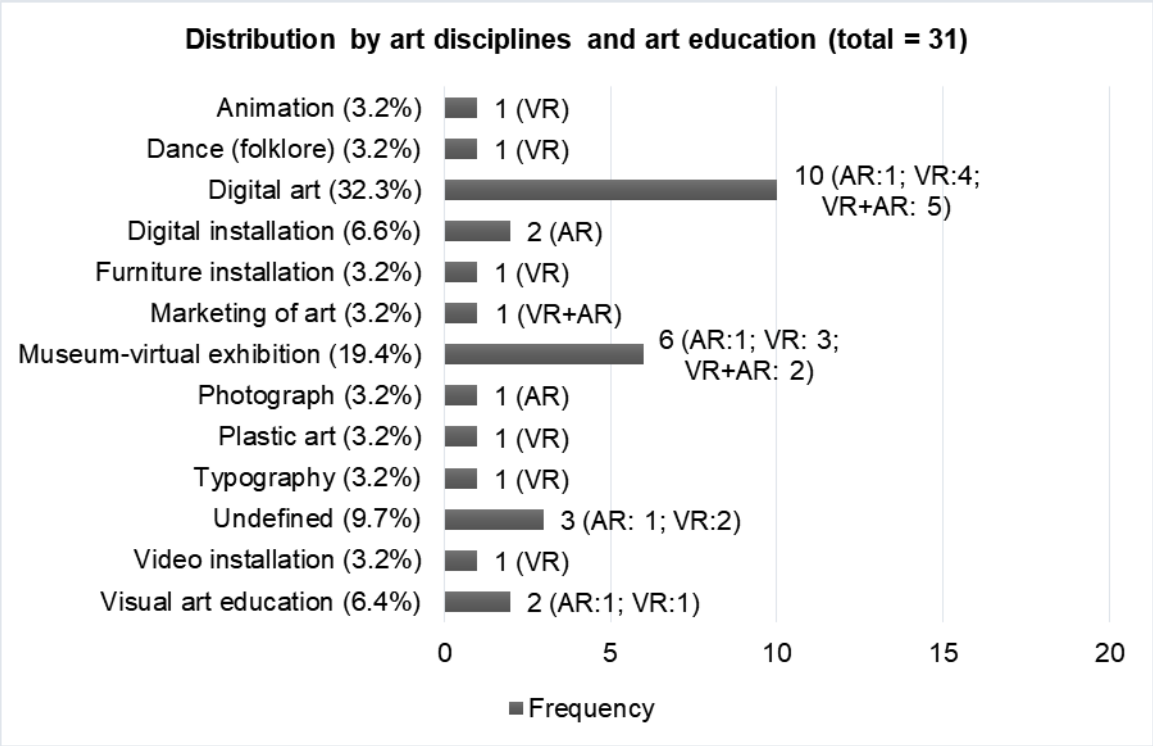


Figure 7 Distribution by art disciplines and art education

As shown in Figure 7, VR and AR technology was mostly applied in digital art (10) and virtual museum exhibitions (6). We determined that one of the studies on digital art included AR, four included VR, and five included VR+AR technology. In three of the studies, no reference was made to art forms; instead, these studies provided theoretical explanations of VR and AR technology in the context of art. In the field of art education, only two studies were found, of which both were related to visual arts education – one included AR and the other included VR technology.

Discussion

With this review we examined the general trends of VR and AR research in art and art education in Türkiye, revealing a strong focus on art forms such as digital art and museum or virtual exhibitions, with VR technology being predominant. Only two studies specifically addressed art education (AR:1, VR:1), highlighting a notable scarcity of research in this subfield. The findings align with Freina and Ott (2015) who observe that VR applications are common in adult education, particularly in virtual art museums, but are limited for younger learners. Similarly, Kavanagh, Luxton-Reilly, Wuensche and Plimmer (2017) identified few studies on VR use in art-related subjects and museum contexts, suggesting that while VR is more commonly applied in museum settings, its use in formal art education remains limited.

In contrast, research on AR in education has predominantly focused on special education, storytelling, three-dimensional (3D) printing, mobile applications, higher education, and game-based learning (Avila-Garzon, Bacca-Acosta, Kinshuk, Duarte & Betancourt, 2021; Seçkin Kapucu & Yıldırım, 2019). Despite its potential to enhance learning experiences through access to museum and gallery collections (Gong, Wang & Xia, 2022), AR research in art education in Türkiye is still emerging, indicating the need for more experimental studies.

Analysis of the 31 studies reviewed shows that VR technology was employed in over half of the studies (16), while VR and AR technology was employed in an additional 25% (8). The earliest study on this topic was published in 2007, while roughly 70% of the studies were conducted after 2020, suggesting increasing scholarly interest. However, compared to global trends – where the

use of AR in education began emerging as early as 1996 and expanded significantly after 2010 (Garzón, 2021) – research in Türkiye lags by approximately a decade.

The delay in integrating the technology into educational environments can be explained by factors such as infrastructural deficiencies, insufficient needs assessments, and the absence of effective technology planning (Keleş & Turan Güntepe, 2018). Academics' reluctance to adapt to technology (Rienties, Brouwer & Lygo-Baker, 2013), along with their limited knowledge, skills, and experience regarding educational technology, further reinforces this situation (Bakioğlu & Karsantık, 2015; Weber, 2013). Moreover, the need for practical training and experiential processes to develop the required competencies adds to the complexity of the integration process (Bakioğlu & Karsantık, 2015; Drouin, Vartanian & Birk, 2014; Perlman, Christner, Ross & Lypson, 2014; Weber, 2013). Another factor is the decline in digital competency among instructors as their professional experience and age increase, placing them within a generation more distant from digital environments (Baran, Taşlıbeyaz & Kayalar, 2023). Additionally, the insufficient ability of pre-service teachers – future educators and academics – to use technology for educational purposes (Aksoğan & Bulut Özek, 2020), as well as the fact that art education is one of the fields with the lowest sense of competency in the use of technology (Tatlı & Akbulut, 2017), further supports this conclusion.

Methodologically, most studies were qualitative, with only one quantitative and one applied research study. This result is consistent with the result of Seçkin Kapucu and Yıldırım (2019). This may be due to a limited readiness or experience in conducting skills-based or experimental VR/AR research in art education (Hiçyılmaz, 2024; Karadavut & Kalyoncu, 2025) or the lack of technological infrastructure and equipment in many educational institutions (Mazlum, 2024; Sarı, 2020). However, revealing the ways that this technology is used in practice, the needs of students and teachers, and possible solutions can provide more concrete and functional data to the field (Mao & Ling, 2025; Ruan, 2022). Therefore, it can be said that a greater need exists for studies that provide more concrete outputs to support educational processes in Türkiye.

The analysis of data collection methods in the reviewed studies indicates a clear preference for qualitative approaches. While one study employed a survey within a quantitative framework, qualitative studies predominantly use visual, auditory, and written documents alongside interviews. This pattern aligns with other research, such as Bacca et al. (2014), P Chen, Liu, Cheng and Huang (2017) and Seçkin Kapucu and Yıldırım (2019). The findings suggest that, although a variety of data collection techniques are in use, document analysis and interviews remain the most prevalent approaches, reflecting the field's current methodological orientation and possibly the nature of research questions being explored.

Data analysis was mostly descriptive, with one study using descriptive statistics (frequency and percentage). However, in almost half of the studies the data analysis method was not specified, highlighting deficiencies in reporting and methodological rigour within the field. This result agrees with that found in research by Seçkin Kapucu and Yıldırım (2019).

Overall, while VR and AR research in Türkiye's art and art education context is increasing, significant gaps remain. To provide more concrete, actionable insight for educators and students, future studies should focus on experimental designs, integration strategies, and practical applications. Thus, a more concrete map can be reached for determining policies regarding the integration of VR and AR applications into art education and updating educational curricula.

Conclusion

The aim of the study was to examine general trends in research on AR and VR technology in the field of art and art education in Türkiye. Using a systematic review approach, 31 studies meeting the inclusion and exclusion criteria were analysed from the DergiPark Academic database, and the identified trends were presented through descriptive analysis with graphics.

The findings indicate that VR, particularly non-immersive VR, has received more attention than AR. The first study emerged in 2007, with research activity gaining momentum in 2018 and peaking in 2021 and 2022. Most studies employed descriptive methodologies, with many lacking explicit information on data collection tools and analysis methods. Research was concentrated on digital art, while only two studies specifically addressed art education.

For future research, we recommend that the database searches are widened and that the underlying reasons for the scarcity of quantitative and applied studies in art education are investigated. Contributing factors may include limited awareness, readiness, experience, hardware infrastructure, materials, and appropriate content. Targeted training and professional development for academics could enhance readiness and facilitate the integration of VR and AR technology in art education. Additionally, there is a need to emphasise experimental and applied research to

provide more concrete, actionable insight for the field.

Acknowledgement

Given the study's research methodology, ethical approval was not required.

No artificial intelligence tools were used in the conduct of the research, data analysis, preparation, or writing of the article. Google Translate was used to translate the article into English, and the English version was sent to a professional team for proofreading.

Authors' Contributions

Both authors contributed equally to the literature review, methodological design, and development of selection criteria, with NGA specifically involved in article selection. Both authors participated equally in data analysis and reviewed the final manuscript.

Notes

i. This study was previously presented in abstract form at EDUCONGRESS 2024, Türkiye, 18 to 21 September 2024.

ii. Published under a Creative Commons Attribution Licence.

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