Artificial Intelligence-Assisted Directed Drawing Technique For Preschool Children

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Abstract

In order to keep up with the speed of science and technology in today's conditions, it is important for human beings to constantly renew themselves and adapt to the changing world and living conditions. In this content, education plays a significant role, and art education, in particular, hold a pioneering role in nurturing civilized individuals. Art education, which is considered important at a young age, takes on the lovomotive task of developing a child's creative power and integrating the knowledge and skills they acquire into real-life applications by incorporating current techniques and tools. The importance of drawing in a child's development can be expressed by its role as a means for perceiving the external world and self-expression. Studies also demonstrate that children utilize the knowlegde and skills they acquire on touch screens in their real lives. Drawing applications with fun themes for children attract attention. However, these applications are generally designed for entertainment purpose and targeted towards children who can read and write. The lack of an educational software that provides audio guidance and teaches drawing with the support of artificial intelligence has led to the development of the 'Artificial Intelligence-Assisted Directed Drawing Technique' as identified in the literature research. This technique supports a child's creativity, enchances their fine motor skills, icreases their digital literacy, and provides an enjoyable learning experience. Additionally, it enables children to create original drawings and express their ideas while guiding their progress and supporting their learning process. The artificial intelligence-assisted directed drawing application is believed to contribute to the development of a child's self-drawing skills, benefical use of technological devices like tablets by preschoolers, and increasing the interest and talent of future generations in artistic activities.

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Introduction

The power of art in education is significant, but compressing art education into a single class period and burdening it with all the responsibilities of art education is a great injustice. The necessity for art education to be applicable everywhere and at all times has reached a level of questioning the quality of certain educations due to remote learning that our children receive

from their homes, as a result of certain technological advancements. In this regard, examining the dimension of creativity alongside the necessity of art education is of great importance among our duties as art educators.

One of the most important objectives of educators is to provide opportunities for children and adolescents to engage in creative communication and interaction, enabling them to perceive and understand themselves and the world they live in the best possible way. In this context, it is believed that by using the technique called "Guided Drawing," which aims to increase a child's creativity with the help of mass media and to make it easier for them to draw certain objects/items they struggle with, individuals who will utilize this technique can be guided and supported by artificial intelligence to create drawings. This drawing technique has been implemented for many years within the framework of student-teacher interaction, and positive results have been expressed by classroom teachers and parents of children. This technique, created through student-teacher interaction, has been transformed into a mobile application under the light of today's technological advancements with the aim of contributing to the field.

According to Dignum; “Digital transformation has become an important growth diver improving the quality of life. Digitalisation has an impact on global, innovative, inclusive and sustainable growth in different sectors” (Dignum, 2021). Mobile technologies, which have changed our lifestyles, have also brought about changes in our learning methods. As a result, they have provided us with opportunities to learn anytime and anywhere. The combination of mobile technologies and information and communication technology, allowing rapid interaction, has made effective learning systems active.

Artificial intelligence, available to teachers and students, help educators to craft courses that are customised to their needs. It creates growing awareness of new technological solutions that provide alternatives for students and promote new teaching and learning methods (Tapalova, O., & Zhiyenbayeva, N., 2022).

In today's rapidly producing information era, where the ability to access and apply knowledge quickly is crucial, the relationship between mobile technologies and learning becomes inevitable (Sharples et al., 2007).

In the twenty-first century, technological advancements have rapidly transformed education, especially during the pandemic, with the effective role of distance learning.

In European countries, artificial intelligence technologies are considered by citizens as a positive addition to the socio-economic life (European Commission, 2020). This rapid change and development in the field of information technology have found their place in the field of education, from computers to tablets and mobile technologies, in terms of distance learning.

Being characteristically ubiquitous, mobile technologies (handheld technologies such as smartphones and tablet computers) are used to facilitate both formal and informal learning (Stockwell & Hubbard, 2013) inside and outside classroom activities (Peng et al., 2020).

Mobile learning (m-learning) has become very popular in today's educational settings as a result of the considerable advancements of information and communication technologies (ICTs) (Han & Shin, 2016). M-learning refers to the use of the ubiquitous communication capabilities and friendly user interfaces which handheld mobile devices and wireless technology offer in the formal learning processes (El-Hussein & Cronje, 2010). M-learning is advantageous in many ways, it facilitates learning to take place anytime and anywhere, and it enables personalization for both students and instructors (Naciri et al. 2020).

Mobile learning, also known as m-learning, is actually referred to as "mobile e-learning" (Mehdipour & Zerehkafi, 2013). According to Harris (2001), it is defined as the intersection of mobile computing and e-learning to create experiences that can be experienced anytime and anywhere. Traxler (2005) defines mobile learning as any learning initiative where portable mobile devices are the single or dominant technology, while Trifonova (2003) defines it as any learning and teaching activity that takes place through mobile devices or mobile environments.

At the end of 2013, it was stated that the number of interconnected mobile devices would surpass the number of living people worldwide, and mobile communication technologies would advance exponentially, with most people having mobile devices with advanced interaction and technology (Pepper, 2013). In this context, the educational potential and role that m-learning will have in the near future cannot be overlooked.

Immersive technologies and artificial intelligence promote practical and innovative education through digital tools and virtual learning platforms (Klašnja-Milićević and Ivanović, 2021). This advanced drawing application, especially for individuals in the preschool age group, has the potential to not only help them develop their self-drawing skills but also allow children to

use technological devices such as tablets effectively and beneficially, contributing to increasing the interest and abilities of future generations in artistic activities.

The "Guided Drawing" technique, which provides a suitable environment and opportunities for children to have freedom-based creativity, use available tools without hesitation, and express their own lines of thought and ideas without copying others' methods, lines, and thoughts, will serve as a guiding compass to enhance their self-confidence and abilities.

Problematic Situation

Considering the advancement into the age of technology, where knowledge progresses alongside technology and educational processes undergo transformation through the integration of artificial intelligence, various applications and numerous technological products have entered our lives. These applications manifest themselves in a wide range within the field of education. In our evolving era, in order for individuals to keep up with society under the guidance of science and technology, it has become an inevitable necessity for them to constantly renew themselves according to the ever-changing world and living conditions. In this context, contemporary educational institutions play a significant role in meeting the artistic and educational needs of individuals and the environment, thus becoming essential for the formation of civilized individuals and society.

With the rapid advancement of technology, the diversification of application and technological products used in education enables students to effectively utilize various new tools and methods such as virtual reality, augmented reality, learning management systems, interactive educational software, and AI-supported instructional materials. Ensuring personalized learning experiences tailored to individual needs to enhance student achievement has become a crucial task for educators. Therefore, individuals must constantly update themselves and adapt to the changing world. Taking this requirement into consideration, educational institutions should effectively utilize technology to impart up-to-date knowledge and skills to students.

AI refers to the technology that enables computers to have the capability to work like humans in an intelligent way, such as inferencing, decision making, planning, perceptions, and learning (Lu, 2019). AI-supported applications and technological tools assist students in developing skills such as analytical thinking, problem-solving, creativity, and collaboration. Furthermore, contemporary educational institutions play a significant role in meeting individuals' artistic

needs. Art helps individuals enhance their emotional expression abilities, unleash their creativity, and enrich their cognitive processes. Art also fosters understanding, empathy, and social cohesion among individuals.

Therefore, contemporary educational institutions cater to individuals' artistic needs by enabling students to develop their artistic skills and unleash their creativity. The integration of art into educational processes supports students' self-expression and deepens their cognitive processes. Additionally, artistic activities and artworks help students comprehend cultural values and develop the ability to view things from different perspectives, fostering social cohesion.

In this context, contemporary educational institutions equip individuals with up-to-date knowledge and skills, enabling them to adapt to a changing world and contribute to societal development. The integration of advancements in technology and art into educational processes facilitates students' self-discovery, enriches their learning experiences, and enhances their future-oriented talents.

The Purpose Of The Research

While children frequently use technological devices such as tablets, they may perceive these devices solely as entertainment tools and overlook their potential for creativity and learning opportunities. Nowadays, children's interest in artistic activities competes with other entertainment options and digital games. This situation can have a negative impact on the development of artistic and creative abilities.

In art teaching, by combining AI with art, we can use advanced digital media for art teaching, enabling students to obtain good visual experience and deepen their un-derstandings and memorization of the art Works (Kong, 2020).

To enhance the artistic skills of preschool children and facilitate their beneficial use of technological devices, teachers and parents should possess proper guidance and resources. However, there might be a lack of sufficient knowledge and resources in this regard. With these objectives in mind, our research aims to highlight the significance and potential problem-solving capability of AI-supported guided drawing applications.

The AI-supported guided drawing technique developed to foster creativity, improve fine motor skills, and enhance digital competencies in preschool-aged children is utilized with the purpose

of stimulating their creativity and supporting expressive skills. This technique offers children the opportunity to use their imagination by employing various colors, shapes, and patterns, while also assisting in the development of their fine motor skills. Drawing on a computer screen before using a brush, pen, or other drawing tools encourages children to perform precise movements and strengthens their coordination. Additionally, in the present era where children are exposed to digital technologies at an early age, AI-supported guided drawing intends to help them enhance their digital skills and adapt to the digital world.

Method

In the technique of artificial intelligence-supported guided drawing for preschool children, user-friendly and interactive interfaces are used. These interfaces are designed to enable children to draw easily and see the results immediately.

Artificial intelligence algorithms analyze children's drawings and provide feedback. They track the children's drawings, correct errors, and provide guidance for improvements. This allows children to progressively enhance their drawings and make progress in the learning process. In this context, the technique possesses a form of instructional guidance algorithm.

The training data used for the artificial intelligence model consists of children's drawings. This data set includes a wide range of examples, including both sample drawings and children's own drawings. The model is trained on this data set and utilizes it to better understand and evaluate children's drawings.

The artificial intelligence-supported guided drawing technique can be customized according to the child's age and skill level. The algorithm monitors the child's progress and provides appropriate guidance accordingly. Thus, a learning experience tailored to each child's individual needs and pace is offered.

The artificial intelligence-supported drawing technique for preschool children may incorporate interactive elements to make the drawing process more enjoyable. For example, features such as live coloring effects, auditory feedback, or animated characters can be used. The aim is to capture children's interest and enhance their motivation.

The AI-supported drawing application allows preschool children to collaborate and share their drawings with others. This helps them develop their social skills and explore their creativity together.

Real-time feedback, which is an important component of the artificial intelligence-supported guided drawing technique, plays a crucial role. Real-time feedback provides instant evaluation and guidance to the child as the drawing process unfolds. The AI algorithm continuously analyzes the child's drawings, detects errors, and promptly provides feedback, demonstrating where improvements are needed or how they can be made. For instance, when a child attempts to complete a shape, the AI algorithm helps them draw the correct line or alerts them to balance uneven lines. Real-time feedback encourages the child to experiment with different approaches, make corrections, and improve their drawings.

These feedback mechanisms boost the child's self-confidence and motivate them through a sense of achievement. Additionally, by allowing the child opportunities to correct mistakes, it facilitates experiencing the learning process as part of their growth.

Real-time feedback is also utilized to monitor the child's progress and identify their areas of interest. The AI algorithm evaluates the child's abilities and weaknesses, and based on this assessment, suggests more advanced challenges or different subjects. Thus, it offers a personalized learning experience to keep the child engaged and sustain their learning motivation.

By continuously promoting learning, accepting mistakes, and fostering an openness to growth, real-time feedback teaches children to be constantly receptive to learning while developing their creativity and artistic expression. Consequently, they acquire the skills to create unique and confident drawings.

Discussion, Conclusion, and Recommendations

In order for children to possess freedom-based creativity, utilize available tools without hesitation, and express their own methods, lines, and thoughts without copying others, it is crucial to provide a suitable environment and opportunities that enable them to develop self-confidence and abilities. The technique of "Guided Drawing" serves as an instructive guide in this regard.

The guided drawing system enables users to create drawings by making selections from various categories. For instance, when prompted to draw a circle, the user produces the drawing through the interface. The server verifies whether the drawing corresponds to the given drawing command, thereby determining the success of the drawing. If the drawing does not align with the specified drawing command, the server suggests corrections using artificial intelligence to improve the drawing. If the drawing is in accordance with the drawing command, the interface notifies the user of its successful completion. Through the analysis conducted by the server using artificial intelligence, the personal analysis of the individual who created the drawing is performed. The server examines whether there are any deficiencies or excesses in the lines, thereby identifying any potential obstacles faced by the person drawing. It also evaluates the drawings using artificial intelligence to determine psychological characteristics, such as the level of disarray, aggressiveness, or inadequacy of the lines, thereby identifying the psychological traits of the person creating the drawing. By evaluating the drawings using artificial intelligence, the server identifies situations in which users produce drawings at a higher level relative to their age, thus enabling the identification of exceptionally talented users.

A patent application titled "Guided Drawing" has been approved by the Board of Directors of Bilecik Şeyh Edebali University, and it is currently under examination with a positive evaluation, initiating the patent process. The patent application has been submitted to the Turkish Patent and Trademark Office under the number "2023/003213," and the technique is currently in the research phase. The technique is envisioned to be a pioneering application in the field of art education, with plans to implement it through a mobile application.

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