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Implications of AI art generators to broaden visual literacy and creative expression for young learners

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Abstract: The study investigates possibilities of leveraging generative AI (i.e., AI art generators) in educational settings for children (3rd to 5th graders). First, we investigated the advantages and limitations of AI art generators to find out how they can be used as AI-powered learning tools. To do this, we evaluated an AI art generator, Dall.e (OpenAI, 2022), during the activity of creating poster cards with poems. From the evaluation, we found the AI art generator provides opportunities to empower creativity, visual literacy, visual arts, and language arts with suitable curriculums and pedagogical design. We propose research collaboration with AI developers, educators, and researchers to iteratively design, develop and evaluate AI-powered learning tools with proper learning theories, curriculums, and pedagogies. Ultimately, we introduce design suggestions for employing the AI art generator as an AI-powered visual narrative tool in educational settings.

Introduction

AI-based learning tools have been explored in educational research for decades, including intelligent tutoring systems (ITS), learning analytics, and AI-driven robotics. One of the promising benefits of leveraging AI in education is affordance in personalized, adaptive learning at scale (Hwang et al., 2020). Although with the emergent technical development of AI generators, it is difficult to adapt and apply it in dynamic educational settings. Hence, there need to be more studies that examine leveraging AI for creative expressions for young learners.

Text-to arts AI generators such as Dall.e, Midjourney, and Stable Diffusion facilitate users to generate high-quality images from text input (i.e., prompt) with a description of the image, like colors, composition, and objects (OpenAI, 2022). Such generative AI tools allow learners to create multi-sensory (visual, textural, and auditorial) content that is accessible and fast, lowering cognitive load for young learners. Research has demonstrated that learners engage and learn better with multi-sensory engagement and interactive learning experiences. The generative AI tool affords a constructionist approach by facilitating learners to become active agents of their experience through creating personally meaningful digital content (Papert, 2020). We aim to examine new opportunities for AI art generators to support young learners to become content creators, promoting creative expression and visual literacy. The following research questions guided the study:

- How should the text to arts AI generation experiences be best designed to support learning for young learners ages 8 to 10?
- To what extent will text to arts AI generation facilitate learners' discussion and instruction of visual literacy and creative expressions?

Background

The ability to interpret and employ visual messages is as important as textual literacy to facilitate effective communication. Critical visual literacy (i.e., the ability to encode and decode visual elements, critically analyze and employ images to convey messages) is one of the essential literacy skills in this multi-media-driven society full of images around us (Papen., 2019). Researchers have suggested incorporating visual literacy education, including integrating and constructing visual compositions to deliver learners' messages and ideas through images with text (Papen, 2019).

Critical thinking and divergent and convergent thinking skills are essential in a fast-paced society (Fasko, 2001). Cultivating creative thinkers has also been a hot topic in education (Fasko, 2001). Within the constructionist approach to teaching and learning, students learn better when actively engaged in what they're learning through making and creating. AI art generators afford learners to create personally meaningful digital artifacts (Papert, 2020) by generating and customizing digital outputs. The digital-making activities encourage learners to generate ideas (divergent thinking) and apply and construct artifacts (convergent thinking) which promote creative problem-solving skills through the iterative design cycles (Fasko, 2001).

Evaluation of the AI art generator

To examine opportunities to leverage text-to-art AI generators for learning and teaching purposes, we examined the possibilities of using the current text-to-art AI generator, Dall.e (OpenAI, 2022). We had an activity for creating a poster with poetry titled "Dust of Snow" by Robot Frost (see Figure 1). The poetry we selected is one of the third-grade curriculums in the public school in Southern California,

United States. We sought to explore if the tool could afford to generate images to convey certain messages and ideas from the textural descriptions in practical ways.

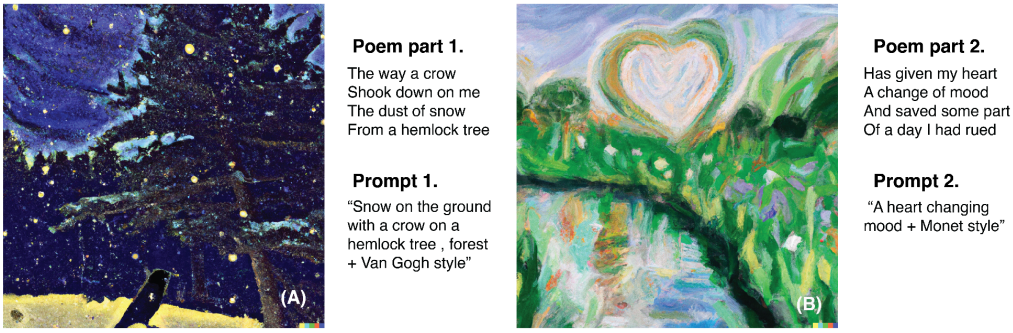

Figure 1. Left (A) and Right (B) are images that are generated from Dall.e (OpenAI, 2022), a text to arts AI generation tool with the text input (prompt) of the poem "Dust of Snow" by Robert Frost.

Findings

From the evaluation, we found the AI art generators facilitate empowering *creativity* (from divergent and convergent thinking experiences through iteratively generating and selecting images to convey ideas), *visual literacy* (by interpreting, analyzing, and employing image outputs to deliver their messages), *visual arts* (by applying different art styles and working on generating aesthetical images with proper color, composition), and *language arts* (with a typing text description of images into prompt).

For creative expressions, we found that text-to-art AI generators boost learners' imagination, elaboration, and decision-making skills that support children's critical literacy and creativity (divergent and convergent thinking). For visual arts, AI art generators can be a new medium for artistic expression. Lastly, typing text inputs for image generation provides access to new vocabulary and connects illustrations with contextual cues, which supports comprehension and inference skills for young learners. Also, visual elements (i.e., illustrations, pictures, and photos) foster engagement and comprehension skills for 2nd to 4th graders (Papen, 2019).

Discussion and Implications

The study explored new opportunities for leveraging text-to arts AI generators for educational purposes. From the evaluation, we found the tools afford visual literacy development for young learners. We propose leveraging the text-to-arts AI generator for visual narrative activities (See Figure 1), such as creating a poster, cards, comics, and picture storybook. Creating visual narratives with text- to art AI generators can promote learners' ability to deliver their messages through an iterative design cycle of generating, analyzing, and editing AI-generated images for their stories. In addition, we propose research collaboration of AI developers, educators, and researchers to iteratively design, develop and evaluate AI-powered learning tools with suitable learning theories, curriculums, and pedagogies. As this AI art generator was not developed for educational purposes, it should be supplemented with an appropriate curriculum and learning theory. To this end, the next step of the research is to conduct participatory research with educators to examine pedagogical approaches to design curriculums. We seek to iteratively design and develop learning tools with generative AI for visual narrative activities.

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