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Article

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Abstract: This study delves into the burgeoning intersection of Artificial Intelligence (AI) and art history education, an area that has been relatively unexplored. The research focuses on how AI art generators impact learning outcomes in art history for both undergraduate and graduate students enrolled in Ancient Art courses, covering eras from ancient Mesopotamia to the fall of Rome. Utilizing a mixed-methods approach, the study analyzes AI-generated artworks, reflective essays, and survey responses to assess how these generative tools influence students' comprehension, engagement, and creative interpretation of historical artworks. The study reveals that the use of AI tools in art history not only enhances students' understanding of artistic concepts but also fosters a deeper, more nuanced appreciation of art from the periods studied. The findings indicate that engaging with AI tools promotes critical thinking and creativity, which are crucial competencies in the study of art history. Survey data further suggest that the integration of AI in art history positively influences students' perceptions of the discipline, aligning well with contemporary digital trends. One of the significant outcomes of the study is the varied experiences of students with AI tools. While some faced challenges with the technology, particularly in accurately capturing complex artwork details and crafting effective prompts, others found success in using AI to generate detailed and creative interpretations of historical pieces. These experiences underscore the potential of AI as a valuable pedagogical tool in art history and humanities education, offering novel insights into teaching methodologies.

Keywords: digital art history; formal analysis; close looking; AI art; generative AI

1. Introduction

Art history has traditionally been taught through a combination of lectures and discussion, focusing heavily on visual analysis and close looking [1]. The approach, often termed formal analysis, centers on the detailed examination of the visual features of artworks and involves describing these features systematically and analyzing their effects, using a set of established terms and concepts like format, scale, composition, viewpoint, treatment of the human figure and space, and the use of form, line, color, light, and texture [2]. This method aims to decipher and convey the visual experience of art, guiding students to understand not just the subject matter or historical context, but the artistic form itself and its impact on viewers. Over time, while the essence of formal analysis remains, its interpretation has shifted from a presumed universality in human response to visual form to a more subjective understanding, still valued as a critical exercise in analyzing visual experience, especially in introductory art history courses [3].

In teaching formal analysis, art history educators often employ a variety of assignments designed to hone skills in close-looking and critical thinking. A common assignment is a close-looking exercise, where students are asked to spend an extended period observing a single artwork, noting every detail, from the brushwork to the use of light and color [4]. These exercises train them to notice nuances they might otherwise overlook and develop a deeper understanding of artistic techniques. Another typical assignment is the compare and contrast essay, where students select two artworks, often from different periods or styles, and analyze their similarities and differences in form, technique, and content [5]. The task encourages students to think critically about how different contexts and artistic movements affect visual expression, while the outcome of such analysis should be a description that effectively verbalizes the visual experience. This means converting visual stimuli into words in such a way that a reader can recreate a mental picture of the artwork being described. Such descriptions call attention to important qualities of the work, such as composition, use of color and light, thematic elements, and stylistic nuances. The ability to produce such vivid, detailed descriptions is a fundamental skill in art history, enabling students to communicate their visual experiences and insights effectively [6].

While traditional approaches to improving student abilities in formal analysis have remained fairly analog, more digital interventions are being seen [7]. The increasing integration of emergent technologies in digital art history has been spearheaded by innovations such as virtual reality (VR), which has notably enhanced formal analysis skills. VR provides an immersive environment that allows for detailed comparisons and replicates the experience of in-person art viewing, thus significantly contributing to the development of critical analytical skills in art history [8]. However, the potential of new abilities of generative artificial intelligence (AI) as a complementary tool in this domain has yet to be fully explored. AI, especially in the form of AI art generators, offers a unique opportunity to further refine formal analysis skills. By enabling students to recreate historical artworks using AI, they engage in a deep, hands-on exploration of art elements such as composition, style, and technique. This approach not only reinforces their understanding of art history but also introduces them to the innovative possibilities of AI in art creation and study. Consequently, as Zullich et al. [9] have observed, AI stands as a promising addition to the digital art history classroom, complementing existing technologies like VR and broadening the scope of teaching methodologies in art historical analysis.

Aligning these traditional strategies with prompt engineering for generative visual models of AI, such as Dall-E 3, Midjourney, or Stable Diffusion, offers an intriguing extension of this skillset. In the context of AI, prompt engineering involves crafting descriptive prompts to guide AI in generating specific visual outputs. This process closely mirrors formal analysis in art history; both require a keen eye for detail and the ability to translate visual elements into precise, descriptive language. However, in the case of these new generative visual tools, the descriptions are used as inputs for the model to create visual representations [10]. By applying their formal analysis skills to prompt engineering, students can learn to manipulate generative AI tools effectively, crafting prompts that result in accurate visual recreations of historical artworks. The intersection of traditional art historical techniques and modern AI

technology represents a novel and potentially powerful tool in art education, blending close-looking and descriptive prowess with digital innovation [11].

The strategies of teaching formal analysis and close looking at art history, while well-established, have not been extensively explored in the context of modern AI technologies, particularly in the realm of prompt engineering with AI generative tools. This study represents a pioneering effort to investigate how these traditional art historical methodologies can be adapted and applied in an AI-centric environment. The pedagogical strategy devised for this study involves an innovative approach: starting with the traditional methods of teaching formal analysis and close looking, students are then tasked to use these skills for prompt engineering. The objective is to recreate, as closely as possible, the original artwork being described using an AI generative tool, such as Dall-E 3 or Midjourney. A crucial aspect of this approach is the restriction placed on students from using identifiable descriptors in their prompts, such as the title, region, style, or any other metadata of the artwork that the training model might scrape from. This constraint ensures that the students rely solely on their ability to verbalize the visual elements and qualities of the artwork without leaning on easily identifiable, pre-categorized information.

The methodology employed in this study, encompassing the analysis of AI-generated artworks, reflective essays, and survey responses, is designed to thoroughly evaluate the effectiveness of integrating AI tools in art history education. The anticipated results are expected to shed light on the depth of understanding and level of engagement students attain through this novel pedagogical approach. By closely examining the outcomes of using AI art generators, the study aims to discern how these tools influence the development of formal analysis skills and overall learning experience in art history. Expected outcomes include insights into how students perceive and interact with AI technology in an academic setting, the challenges they encounter, and the successes they achieve. The study also aims to explore how AI-generated images and the process of creating them enhance students' understanding of historical artworks. The results are anticipated to provide a nuanced understanding of the potential role of AI tools in art history education, highlighting both the opportunities and limitations of this approach.

Based on the data and discussions in this study, the findings indeed offer significant contributions to the pedagogy of art history. The results indicate that while AI tools, such as Stable Diffusion and Dalle-3, have the potential to enhance the teaching and learning of art history, particularly in the areas of formal analysis and close looking, their integration requires careful consideration. The study showed that students' experiences with AI tools varied: while some found these tools effective in enhancing their understanding of artworks, others faced challenges with anatomical accuracy and prompt specificity. The findings also revealed a diversity in students' perceptions of AI's role in art history education. While some students recognized the potential of AI in providing novel perspectives and aiding in visual analysis, others remained skeptical about its effectiveness and expressed concerns about AI's limitations. These results underscore the need for a balanced approach to AI integration, one that acknowledges both its capabilities and its limitations. Ultimately, this study suggests that emerging technologies like AI can be innovatively integrated into traditional teaching methodologies in art history, potentially transforming

teaching practices. However, this integration should be done thoughtfully, ensuring that technology complements rather than replaces traditional methods. The implications of this study extend beyond art history, providing a model for how technology can be integrated into other humanities disciplines, thereby contributing to the broader educational landscape. This integration, if done effectively, can enrich learning experiences and open up new avenues for exploration and understanding in the humanities.

2. Literature review

Teaching formal analysis and close looking in art history classes is pivotal for cultivating an in-depth understanding of art history and the intricacies of individual artworks. This pedagogical approach emphasizes detailed observation and the articulation of visual elements, which are central to formal analysis. Walton [12] highlights the significance of finding the right words to describe visual aspects, an essential skill in art historical analysis. According to Gasper-Hulvat [13], formal analysis, which examines form and structure of a work, is often the foundation of art historical inquiry and serves as a critical method for discussing art, particularly when integrated with other interpretative approaches. This type of analysis typically involves a thorough visual examination of art, focusing on its constituent elements and the principles of design employed by artists across different mediums.

Within art history courses, students engage with a variety of assignments that encourage these analytical skills. These tasks range from visual analysis essays, where students focus intensely on the artwork itself, to comparison essays and research papers that may incorporate primary textual sources for deeper contextual understanding [14]. The emphasis in visual analysis essays is primarily on close observation, often minimizing the reliance on extensive secondary sources [15]. Such assignments are designed to hone student abilities to scrutinize and articulate their observations, thereby deepening their understanding of art historical methods and the artworks themselves. Successful navigation of these tasks requires a clear comprehension of the assignment prompts, underscoring the importance of aligning analytical skills with specific academic expectations [16].

The thematic exploration of formal analysis scholarship in art history reveals its multifaceted role and evolving methodologies. For instance, Olin [17] delves into the historical roots of formal analysis in the United States, tracing its origins to the nineteenth century. Initially perceived as a detached method for classifying and analyzing art, drawing inspiration from natural sciences, formal analysis was considered foundational to art historical thought. However, Olin challenges this view, suggesting that it was more of a superstructure, with its authority lending it a foundational appearance. The study also explores the interconnection between art history and scientific disciplines like comparative anatomy and physical anthropology, particularly through a case study involving collaboration during the "Great War". Prown [18] had previously parsed the distinction in professions with the distinct role of art historians being differentiated through a focus primarily on artworks. He delineates "formal analysis" and "stylistic analysis", emphasizing that these concentrate on the art object's configuration and style. Prown posits that style, as a

blend of form and distinctive manner, is culturally expressive, thus making it valuable for understanding broader cultural contexts beyond art history.

In 2015, Locher et al. [19] explored the impact of formal art training on the perception and aesthetic judgment of art compositions. Their study investigates whether such training deepens the analysis of compositional elements, influencing both the visual exploration and aesthetic evaluations of artworks, particularly those that exhibit variations in balance and symmetry. Nelson [20] followed this in 2017, focusing on the use of Visual Thinking Strategies (VTS) in art and information literacy instruction. VTS, a method developed by Housen and Yenawine, utilizes art discussions to encourage participation, critical thinking, and detailed observation. Nelson illustrates how VTS not only enhances research strategies but also connects to formal and critical analysis in art history. Collectively, these studies highlight the dynamic nature of formal analysis in art history education, emphasizing its evolving methodologies, pedagogical significance, and potential for cross-disciplinary application and innovative teaching practices.

These examples highlight that teaching formal analysis and close looking in art history classes involves guiding students to develop the skills of close observation, critical thinking, and effective communication of their analyses. It is essential for students to understand the elements of art and principles of design, as well as to learn how to analyze and talk about art using formal analysis as a starting point. Teaching formal analysis and close looking for art history classes is crucial for developing student skills in analyzing and interpreting artworks. It involves close observation, critical thinking, and understanding the elements of art and principles of design, which are essential for gaining insights into the histories of art and effectively communicating about art [21]. At the same time, scholarship on teaching and learning associated with formal analysis in art history has shown a significant shift towards enhancing student engagement and learning outcomes, especially in online environments. Kutis [2] explores this evolution and presents a case study that underscores the importance of scaffolding assignments in online courses, particularly in introductory art history classes. This approach involves breaking down the standard formal analysis assignment into smaller, manageable tasks using the learning management system (LMS), Canvas.

The transition of college courses to online platforms presents unique challenges, especially in maintaining effective faculty-student interaction and offering real-time guidance for complex projects. Kutis highlights those scaffolding assignments can significantly boost student success. This method entails creating smaller tasks that progressively build toward a larger, more intricate assignment. Scaffolding not only allows students repeated practice in developing their visual analysis and writing skills but also provides opportunities for frequent instructional feedback. These practices are recognized as best practices in the pedagogy of teaching and learning. By focusing on specific aspects of the larger formal analysis task in each mini-assignment, students can refine their skills step by step. This method also allows for continuous teacher input, crucial in an online setting where direct interaction is limited. The approach demonstrates quantitatively that such scaffolding improves student learning and success, suggesting that this technique is beneficial for students in developing critical skills necessary for formal analysis in art history. This strategy aligns well with the

current emphasis on self-regulated learning, catering to the evolving needs of students in the digital age.

Transitioning from Kutis [2], who emphasizes the use of LMS to deconstruct formal analysis into manageable steps, we enter the domain of text-to-image AI technology, which offers a groundbreaking shift in art history education. While these tools have been widely explored for artmaking purposes, their potential in art history teaching remains largely untapped [22]. AI art prompts, which are textual instructions guiding text-to-image generators to create original artworks, utilize AI algorithms trained on extensive visual art datasets. The process allows the AI to mimic diverse artistic styles and techniques. Therefore, advancing into the realm of Text-to-Image artificial intelligence, significant developments, notably with Dall-E and Stable Diffusion, present intriguing possibilities for visual arts education. Dehouche and Dehouche [23] delve into the impact of these AI programs on art history, aesthetics, and technical instruction. Analyzing a large sample of 72,980 Stable Diffusion prompts, their research contributes to the formalization of this innovative art creation method. Their findings indicate that Text-to-Image AI holds the potential to revolutionize art education, offering cost-effective and inventive avenues for experimentation and expression. Yet, these advancements also bring to light concerns regarding the ownership of AI-generated artworks, signaling an urgent need for novel legal and economic models to protect the rights of artists [24]. The shift towards AI in art history education represents a significant step in exploring new methodologies and addressing contemporary challenges in the field.

Following these studies, Gu et al. [12] provide a comprehensive overview of prompt engineering—a technique involving the augmentation of large pre-trained models with task-specific hints, known as prompts, to adapt the model to new tasks. This paper surveys the latest research in prompt engineering across different types of vision-language models like multimodal-to-text generation models (e.g., Flamingo), image-text matching models (e.g., CLIP), and text-to-image generation models (e.g., Stable Diffusion). Gu et al. [12] discuss the summaries of these models, prompting methods, applications, and associated responsibility and integrity issues. Their work underscores the significance of prompt engineering in bridging vision-language models with real-world tasks and the challenges and future directions in this rapidly evolving field. Both these studies highlight the transformative potential of AI in visual arts education, especially in teaching art history and formal analysis, while also acknowledging the ethical and legal considerations that accompany this technological leap.

In the context of visual arts education, integrating text-to-image AI raises questions about the role of artistic intentionality. While there is a concern that relying on AI systems might limit the range of expressions available to students, potentially leading to a homogenization of artistic output, these technologies also offer unique benefits [25]. I art generators can foster a deeper understanding and appreciation of different artistic styles, movements, and methods among art history students. By inputting specific prompts and choosing styles, students can generate captivating AI-created art that reflects various historical periods and artistic approaches. In teaching art history, the use of AI art generators can be particularly impactful. They provide a novel, interactive way for students to engage with and analyze historical artworks,

styles, and techniques. This approach not only encourages a more active learning process but also serves as a valuable tool for igniting creativity and imagination, allowing students to explore the vast possibilities of artistic expression through a modern, digital lens.

3. Methodology

The methodology for this mixed-methods study focused on examining the efficacy of AI art generators in teaching art history. The study was conducted at a private, four-year liberal arts institution located in the suburban area of St. Louis, Missouri. Participants included undergraduate and graduate students enrolled in an Ancient Art course, which covered periods from ancient Mesopotamia through the fall of Rome. The course was offered online, presupposing a basic understanding of digital tools among the students. The study sample comprised 24 undergraduate and graduate students of which 8 were respondents from the College of Arts and Humanities all majoring in Art History and Visual Culture. The primary goal of the project was to assess pedagogical best practices for the use of AI art generators in art history education, focusing on student perceptions, performance, and feedback, supplemented with instructor observations.

Participants were tasked with a specific assignment (**Table 1**): to use an AI art generator to recreate a piece of art from the course material. The students were encouraged to use free AI art generators such as Midjourney, Stable Diffusion, Craiyon, DALL·E 2, or, for those with access, ChatGPT-4 with DALL·E 3. They were instructed to apply formal analysis techniques learned in the class to craft prompts that would guide the AI in generating images as close as possible to the original artworks. The students were not allowed to use identifiable descriptors such as the work's title, region, or style in their prompts.

The study utilized both qualitative and quantitative data collection methods. An online survey, conducted at the beginning and end of the Fall 2024 term, collected demographic information and students' expectations and experiences with AI generative art. The survey included open-ended questions allowing students to express their views on the pedagogical effectiveness of AI in art history. Data from the surveys were collected using Qualtrics to ensure privacy and anonymity. Descriptive statistics were calculated from the survey responses for comparative analysis.

Additionally, the study analyzed the final AI-generated images and reflective essays submitted by the students. These artifacts were evaluated to understand the depth of students' formal analysis skills and their ability to translate these skills into AI prompts. Instructor feedback and observations provided further insights into the learning outcomes and the pedagogical effectiveness of integrating AI art generators into art history education. This mixed-methods approach aimed to provide a comprehensive understanding of how AI art generators can enhance the teaching and learning of art history, specifically focusing on the development and application of formal analysis skills in a digital context.

Table 1. AI art history assignment.

Assignment instructions

In this assignment, you will engage with art history in an innovative way by combining your knowledge of art with cutting-edge AI technology. You will select an artwork covered in our class and attempt to recreate it using an AI art generator. This exercise will not only reinforce your understanding of the selected work but also expand your skill set in digital art creation and prompt engineering.

Component	Description
Assignment name	AI art history assignment
Objective 1	Demonstrate understanding of a historical artwork through detailed formal analysis.
Objective 2	Apply prompt engineering skills to recreate the artwork using AI technology.
Objective 3	Reflect on the intersection of art history and AI in the creation and study of art.
Step 1: Select an artwork	Choose a piece of art covered in this class. It should be a work that resonates with you, from any period discussed.
Step 2: AI art generators	Before creating your artwork, you must understand the capabilities and limitations of the AI tool you'll be using. Here are some options: Midjourney (Web-based): Midjourney https://www.midjourney.com/home (note: must be accessed via Discord account) Stable diffusion (Web-based): Stable diffusion https://stability.ai/stable-diffusion/ Craiyon (formerly DALL·E mini, Web-based): Craiyon https://www.craiyon.com/ DALL·E 2 (Subscription-based): DALL·E 2 https://openai.com/dall-e-2 ChatGPT-4 with DALL·E 3 (Subscription-based): For those with access, use your ChatGPT-4 interface. https://openai.com/blog/chatgpt
Step 3: Formal analysis	Write a detailed visual description of your chosen artwork. Focus on the formal elements such as material, composition, subject matter, lighting, line, form, and structure. Avoid using the title of the work; use only visual descriptors.
Step 4: Create AI artwork	Craft prompts using the formal analysis to guide the AI in recreating the artwork. This may require multiple attempts, refining the prompt with each iteration.
Step 5: Reflective essay	Write a 750–1000 word essay discussing the process of translating art historical analysis into AI prompts, challenges in the recreation process, insights about the artwork, and your view on the role of AI in art creation and history.
Submission requirements	Submit the best AI-generated image and the reflective essay. Include screenshots or descriptions of prompt iterations.

Grading rubric

Criteria	Excellent (90%–100%)	Good (70%–89%)	Satisfactory (50%–69%)	Needs improvement (<50%)
Formal analysis	In-depth and insightful analysis.	Comprehensive analysis with minor gaps.	Basic analysis with some missing elements.	Superficial or significantly incomplete.
Prompt engineering	Highly effective prompts; artwork closely resembles the original.	Effective prompts; artwork resembles the original with minor differences.	Adequate prompts; artwork somewhat resembles the original.	Ineffective prompts; artwork does not resemble the original.
Reflective essay	Insightful reflection, and excellent understanding of AI's role in art.	Good reflection, a clear understanding of AI's role.	Basic reflection, some understanding of AI's role.	Limited or unclear reflection, lacks understanding of AI's role.
Creativity and iteration process	Demonstrates high creativity and thoughtful iteration.	Good creativity and adequate iteration.	Some creativity, but limited iteration.	Lacks creativity and effective iteration.
Overall presentation	Excellent organization and clarity.	Good organization and clarity.	Adequate organization and clarity.	Poor organization and lack of clarity.

4. Results

In the study assessing the integration of AI in art history education, a diverse set of demographic data was collected through a survey instrument. The participant group consisted of 8 students from a digital art history course, providing a range of insights into their educational backgrounds and personal demographics. The majority of participants were at an advanced academic level, with 62.5% ($n = 5$) identifying as graduate students. This was complemented by an equal distribution among sophomores, juniors, and seniors, each category comprising 12.5% ($n = 1$) of the respondents. Such a distribution suggests a varied academic perspective within the course, potentially influencing how students engage with and perceive the integration of AI in their studies.

Regarding age, the participants predominantly fell within the 25–34 age bracket, making up 62.5% ($n = 5$) of the responses. This was followed by the 18–24 age group, which constituted 25% ($n = 2$) of the participants, and a smaller representation in the 35–44 age group at 12.5% ($n = 1$). This age range indicates a mature student body, likely to bring a depth of life experience to their engagement with the course material. The survey also revealed a homogenous gender identity among participants, with 100% ($n = 8$) identifying as female. This gender distribution could provide unique perspectives in the interpretation and creation of art through AI tools.

In terms of ethnicity, the survey showed that none of the participants identified as Hispanic/LatinX. The racial composition was predominantly White/Caucasian, accounting for 70% ($n = 7$) of the respondents, with American Indian or Alaskan Native and Black or African-American students representing 10% ($n = 1$) and 20% ($n = 2$), respectively. This demographic makeup provides insights into the cultural diversity of the participants and how it might impact their approach to and understanding of art history in the context of AI. Additionally, the survey looked into the educational background of the participants' immediate families. A significant majority, 75% ($n = 6$), reported that a family member completed an undergraduate degree, while 12.5% ($n = 1$) had family members who completed some college credits but did not finish their degree, and another 12.5% ($n = 1$) had family members with a Master's degree. This information is indicative of the participants' educational environments and the potential influence of their family backgrounds on their academic pursuits.

Finally, the mode of class attendance was predominantly online, with 87.5% ($n = 7$) of the participants primarily taking classes in this format, and only 12.5% ($n = 1$) attending face-to-face classes. This data is particularly relevant, given the online nature of the course and the use of digital tools like AI art generators. The preference for online classes reflects the growing trend of digital learning environments in higher education and provides context for how students interact with and perceive online learning tools, including those used for creating AI-generated art.

In the study exploring the integration of AI art generators in an art history course, student responses provided valuable insights into their experiences with these emergent technologies. The survey responses revealed how students interacted with AI art generators and their perceptions of the technology's impact on their understanding of art history.

A key aspect of the study was to ascertain students' prior experience with AI art generator tools. Out of the 8 participants, 37.5% ($n = 3$) reported having used AI art generators before the class, while the majority, 62.5% ($n = 5$), had not. This data indicates a relatively new exposure to AI art generation tools among most students, suggesting that the course was likely their first encounter with applying these technologies in an academic setting.

Regarding the specific AI art generators used for the assignment, the survey showed varied usage among students. Craiyon was the most popular choice, used by 50% ($n = 4$) of the students. Midjourney and ChatGPT-4 with DALL·E 3 each were chosen by 12.5% ($n = 1$) of the participants. Notably, 25% ($n = 2$) of the students opted for other unspecified AI tools. This diversity in tool selection illustrates the range of available AI art generators and students' exploratory approach in selecting the tool that best suited their needs for the assignment.

In terms of the challenge presented by using these tools, the responses varied. A total of 75% ($n = 6$) of the students found using the AI art generator to be very easy or somewhat easy, while 12.5% ($n = 1$) rated it as neutral and another 12.5% ($n = 1$) as somewhat challenging. None of the students reported finding the use of AI art generators very challenging. This suggests that, overall, students were able to navigate the AI tools with relative ease, encountering minimal difficulties in their usage.

Finally, when asked about the extent to which the AI tool helped them understand the artwork they were recreating, student responses were mixed. While 25% ($n = 2$) reported that the AI tool did not help them at all, another 25% ($n = 2$) found it moderately helpful, and 25% ($n = 2$) thought it was very helpful. An additional 12.5% ($n = 1$) of the students felt the AI tool was extremely helpful, and 12.5% ($n = 1$) found it only slightly helpful. This spread of responses indicates varied perceptions of the AI tool's effectiveness in enhancing their understanding of the artworks, reflecting the subjective nature of how students engage with and benefit from technology in learning.

Students were then given a free-response question about difficulties encountered while using the AI tool revealed a range of experiences among the students. Selected key quotes illustrate the challenges faced. For instance, one student expressed a significant challenge, stating, "It could not recreate the image because the image was too specific and complex." This comment highlights a limitation of AI tools in dealing with intricate and highly detailed artworks, reflecting the difficulty in capturing the essence of complex pieces. Another student observed the developmental stage of AI platforms, noting, "I did not have a ton of difficulties. But it is more so that I think that the AI platforms themselves are still being developed and though they may get close to the look of a piece, they still don't compare to the entire feeling a piece of art shows or entirely captures its unique features." This response points to the gap between AI-generated images and the depth of emotion or unique characteristics inherent in original artworks. The challenge of creating effective prompts was highlighted by a student: "My biggest difficulty was wording the prompts correctly to get the outcome I was looking for." This difficulty underscores the importance of precise language in guiding AI to produce desired results, a key aspect of prompt engineering. Another student mentioned logistical issues, particularly regarding access to AI tools: "Mainly finding a program that didn't require payment. In creating the image, itself, limbs were a big struggle and unnatural poses were very common." This statement points to the

practical challenges of finding accessible AI tools and the technical limitations of AI in accurately rendering human figures. These responses collectively indicate a variety of challenges faced by students, ranging from the technical limitations of AI tools in capturing complex artwork details to the intricacies involved in crafting effective prompts and accessing suitable platforms.

The concluding part of the results section delves into students' perceptions of the role of AI tools in art history education, their views on how AI can contribute to the study, and their overall feedback on the experience. Responses to whether AI tools have a place in art history education were evenly split across the spectrum. Exactly 25% of the students strongly agreed while another 25% agreed, suggesting a favorable view of AI integration in art history education. However, an equal proportion (25%) were neutral, and 25% disagreed, indicating some skepticism or uncertainty about the role of AI in this field. This diversity in opinions reflects the varying levels of acceptance and readiness to embrace AI as a part of art historical studies.

Students' insights on how AI could contribute to the study of art history revealed diverse perspectives. One student noted the potential of AI in "aiding in image recognition, restoration, cataloging, authenticity verification, personalized content recommendation, contextual analysis, and immersive experiences," underscoring AI's multifaceted utility in enhancing the accessibility and understanding of artistic heritage. Another student expressed uncertainty, stating, "I don't know enough about it yet but I don't see how it has an impact on historical artworks except to cause confusion and misrepresentation." This response highlights a concern about AI's potential to distort the understanding of historical art. Another perspective suggested that AI's growing popularity could offer new insights into both modern and ancient art, including the recreation of lost artworks. Conversely, one student felt that while AI helped in deepening their engagement with the artwork, it did not significantly contribute to their overall understanding.

Finally, students' feedback on their experience with the study was generally positive but varied. One student enthusiastically shared, "I thoroughly enjoyed this assignment and I would be very interested in doing another AI assignment in my other courses!" Another remarked on the assignment's ease: "crazy easy". One student appreciated the innovative nature of the task, finding it both challenging and fun. However, a contrasting view was expressed by a student who felt the exercise was interesting but did not significantly aid in learning or understanding art history. These responses collectively suggest that while there is excitement and appreciation for the innovative use of AI in art history education, there is also a degree of skepticism and concern about its effectiveness and impact on learning. This range of sentiments highlights the complex and nuanced nature of integrating emerging technologies like AI into traditional academic disciplines.

5. Analysis

The split in student responses regarding the role of AI tools in art history education indicates a field in transition. The fact that half of the students either agreed or strongly agreed about the role of AI suggests an openness to embracing new technologies in academic settings. This positive reception might be driven by the

potential of AI to offer novel ways of interacting with and interpreting art. However, the presence of neutrality and disagreement in equal measure also points to reservations and uncertainties. These could stem from concerns about the efficacy of AI in capturing the essence of artworks, its impact on traditional learning methods, or apprehension about the rapid pace of technological change in educational settings.

The varied opinions on AI's contributions to art history reflect a spectrum of expectations and understandings of the technology. The recognition of AI's potential in tasks such as image recognition, restoration, and contextual analysis suggests an acknowledgment of its utility as a tool for enhancing certain aspects of art historical study. However, skepticism about AI's impact on the interpretation of historical artworks, and concerns about misrepresentation, highlight critical reservations. This dichotomy underscores the need for a balanced approach in integrating AI into art history education, one that leverages its strengths while being mindful of its limitations.

The generally positive feedback on the AI assignment, with some students expressing enthusiasm and others noting its ease of use, suggests that such innovative approaches can enhance student engagement and interest. The appreciation for the assignment's creative and challenging aspects indicates that AI can add value to the learning process by providing new experiences and perspectives. However, the viewpoint that the assignment did not significantly aid in learning or understanding points to a gap between the novelty of the technology and its pedagogical effectiveness. This suggests that while AI can serve as an engaging tool, its integration into the curriculum needs to be carefully structured to ensure that it complements and enhances traditional learning objectives.

The analysis of the survey responses indicates that while there is enthusiasm and potential for integrating AI in art history education, there is also a need for careful consideration of how it is implemented. The effectiveness of AI in enhancing learning outcomes in art history lies not just in its technological capabilities, but in how it is integrated into the curriculum and aligned with pedagogical goals. The diverse student experiences and perceptions highlight the importance of addressing concerns about AI's limitations and ensuring that its use supports rather than supplants traditional methods of teaching and learning in art history.

Perhaps one of the most successful came from a student who voiced the most concern over how these tools would be used in their reflective essay. In discussing her generation of the Parthenon, the student wrote:

> I think AI in general is a really interesting and useful resource, but it depends on how people use it and why. When people use AI as a tool for inspiration, fostering creativity, or enhancing personal artistic endeavors, it can serve as a helpful resource to help those who are struggling. The way that AI can generate ideas or assist people in creating captivating pieces can come in handy for artists seeking new avenues of expression. On the other hand, if people use text or art AI generators to either pass off the products as their own or to purposely steal work from others, that is not right. For instance, one of the biggest issues with AI art is the fact that a majority of AI art generators use stolen art made by real artists without their permission.

At the same time, the student followed the assignment as outlined and used several iterative prompt strategies in order to arrive at the image. These prompts included:

The analysis of student artifacts, including the images generated by AI tools and their reflective essays, provides crucial insights into the effectiveness of AI in facilitating the learning of art history and formal analysis. One example, the Nike of Samothrace, was described as a "Marble woman with no head and no arms, right leg stepping forward, clothed in a dress that sticks to her body with wings opened for flight" (**Figure 1**). The student noted that free tools like Craiyon had issues with anatomical accuracy, resulting in limbs with mistakes and awkward poses. This example underscores the limitations of AI tools in accurately capturing complex and nuanced details of human anatomy and poses, a crucial aspect of formal analysis in art history.

Figure 1. Student image replicating Nike of Samothrace.

Another issue was observed in instances where students did not strictly adhere to the assignment guidelines about avoiding specific periods, cultures, or style in the prompt. An example of this was the use of a prompt describing an "ancient Roman statue of a dying Celtic warrior on the ground, pushing himself up with one arm" (**Figure 2**). The generator failed to produce the desired results, as most images did not

depict the figure in a prostrate position, and the prompts were too specific, limiting the AI's interpretative ability.
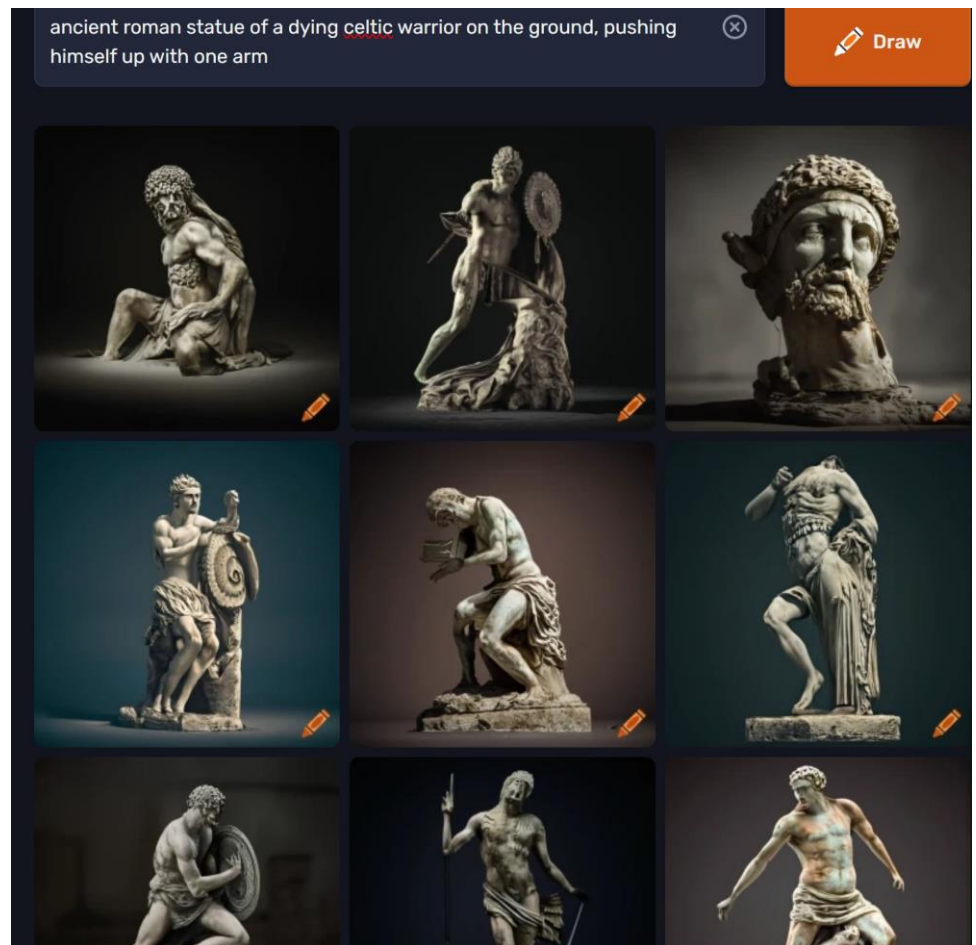

Figure 2. Student image replicating Dying Gaul.

Conversely, some students achieved success with their AI-generated images. A notable example involved the Laocoon (**Figure 3**), where a student produced six variations using Stable Diffusion. The prompts used were detailed yet open-ended, such as describing a "muscular, middle-aged man with short, tousled hair, being attacked by a serpent." The use of detailed descriptors led to images resembling aged engravings, showing the potential of AI in capturing the essence of art with proper prompting.
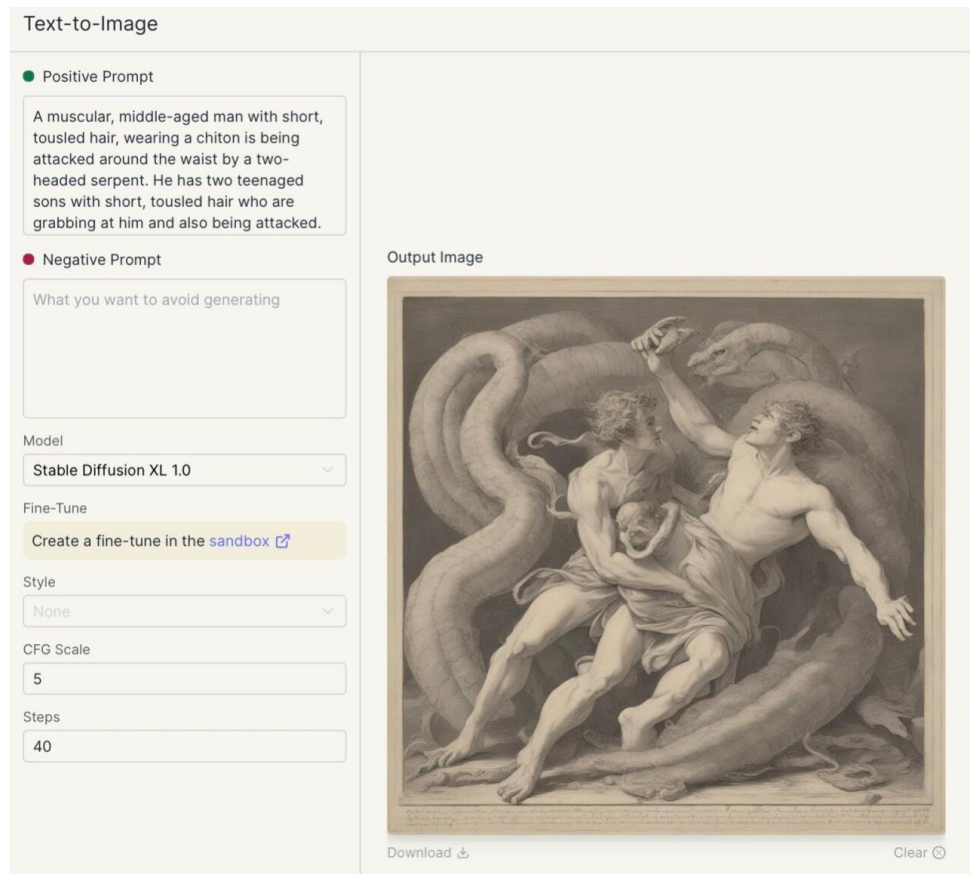
Figure 3. Student image replicating Laocoon.

One of the most successful examples was from a student who initially expressed concerns over AI usage in art. In their reflective essay, the student acknowledged AI's potential as a source of inspiration and creativity but cautioned against its misuse. As the student wrote:

I think AI in general is a really interesting and useful resource, but it depends on how people use it and why. When people use AI as a tool for inspiration, fostering creativity, or enhancing personal artistic endeavors, it can serve as a helpful resource to help those who are struggling. The way that AI can generate ideas or assist people in creating captivating pieces can come in handy for artists seeking new avenues of expression. On the other hand, if people use text or art AI generators to either pass off the products as their own or to purposely steal work from others, that is not right. For instance, one of the biggest issues with AI art is the fact that a majority of AI art generators use stolen art made by real artists without their permission.

At the same time, their output was exceptional. This student meticulously followed the assignment, using iterative prompts to describe the Parthenon (**Figure 4**) with varying degrees of detail, such as:

- A grand peripteral, Doric order temple made of white marble. 8 columns on the front and 12 columns on the sides. It is missing the roof and tiles, and the marble is weathered from age.

- A grand peripteral, Doric-order temple made of white marble that has now faded with age. the temple has 8 columns on the front and 12 columns on the sides. The roof of the temple is missing and the pediments are severely damaged.

- A massive peripteral temple made of yellowed marble with 8 Doric order columns on the front and 12 Doric order columns on the sides. The roof of the temple is missing and the pediments are severely damaged.

- A massive peripteral temple made of yellowed marble with 8 Doric order columns on the front and 12 Doric order columns on the sides. The roof and interior of the temple is destroyed and the pediments are severely damaged.

- A massive peripteral temple made of yellowed marble with 8 Doric order columns on the front and 12 Doric order columns on the sides. The roof of the temple is destroyed and the pediments are severely damaged. The interior of the temple was destroyed, leaving the interior empty and open.

- A long peripteral temple made of weathered, yellowed marble with 8 plain Doric order columns on the front and 12 plain Doric order columns on the sides. The temple's roof is missing and the pediments are severely damaged and broken. The interior of the temple is gone, leaving the inside empty and open.

- A long peripteral temple made of weathered, yellowed marble with 8 plain Doric order columns on the front and 12 plain Doric order columns on the sides. The temple's roof is missing and the pediments are severely damaged and broken. The interior of the temple is gone, leaving the inside empty and open. It sits on rocks in front of a blue, cloudy sky.

Figure 4. Student image replicating the Parthenon.

The gradual evolution of these prompts resulted in a nuanced representation of the Parthenon, exemplifying the effective use of AI in understanding and recreating historical architecture.

The student artifacts and reflective essays from this study highlight both the challenges and possibilities of using AI in art history education. While AI tools can sometimes struggle with complex imagery and nuances, with thoughtful and detailed prompting, they can also provide valuable insights and creative interpretations of historical artworks. The success of these AI-generated images in educational settings is contingent on the precise and informed use of language in prompts, coupled with a deep understanding of the artworks being described.

6. Recommendations

In light of the findings and analysis of the study on integrating AI tools in art history education, several recommendations can be made to enhance the learning experience and outcomes. Firstly, it is advisable to encourage the use of more advanced and sophisticated AI tools such as Stable Diffusion and Dalle-3 in art history courses. These tools have shown a higher capability in accurately interpreting and rendering complex art-related prompts. Their advanced algorithms can better handle the intricacies and nuances of artworks, making them more suitable for educational purposes in art history. By utilizing these more powerful tools, students can achieve a closer approximation to the original artworks in their AI-generated images, thereby enhancing their understanding of formal analysis and artistic techniques.

Secondly, it is crucial to ensure that students have a solid understanding of formal analysis and the objectives of the assignment. This understanding is key to effectively using AI art generators. Students should be guided to focus on describing the formal elements of artworks, such as line, shape, color, texture, and composition, without including descriptors that pertain to the period, culture, or style. Clear instructions and examples should be provided to help students craft prompts that are focused solely on visual and formal aspects. This focus will aid in reducing misinterpretations by the AI and lead to more accurate recreations of the artworks.

Additionally, offering training and guidance in the art of prompt engineering is recommended. Prompt engineering is a critical skill in the effective use of AI tools, as the quality of the output heavily depends on the input prompt. Workshops or instructional sessions can be conducted to teach students how to construct effective and precise prompts. These sessions could include exercises in translating visual analysis into written descriptions and iteratively refining prompts based on AI-generated outputs. By enhancing their prompt engineering skills, students can better navigate the capabilities and limitations of AI tools, leading to more successful outcomes in their assignments.

Finally, establishing robust monitoring and feedback mechanisms is important. Continuous monitoring of how students interact with and utilize AI tools can provide valuable insights into their learning process. Regular feedback from instructors will help students fine-tune their approach to using AI in art history. This feedback could take the form of critiques of the AI-generated images and discussions of the reflective essays. Through this iterative process of creation, feedback, and refinement, students

can progressively improve their skills in formal analysis and their understanding of how AI can be used as a tool in art history education. Implementing these recommendations can significantly enhance the efficacy and educational value of AI tools in art history courses, ensuring that they serve as a complement to traditional learning methods and contribute positively to students' understanding of art and its analysis.

7. Conclusion

This study has provided valuable insights into the potential and challenges of integrating AI tools into art history education. The key takeaways from the research underscore both the opportunities and the nuanced complexities involved in using AI for teaching and learning in the field of art history. The study revealed that while AI tools, particularly advanced ones like Stable Diffusion and Dalle-3, have considerable potential in aiding formal analysis and close looking at art history, their effectiveness is heavily dependent on how they are utilized. Students' varied responses and experiences highlighted the importance of precise prompt engineering and a deep understanding of formal analysis. The challenges faced, such as difficulties in accurately capturing complex artworks and issues with overly specific prompts, point to the limitations of current AI technologies in fully grasping the nuances of artistic expression. The research demonstrated that AI tools could significantly contribute to art history education, particularly in enabling students to engage with artworks in innovative ways. These tools offer novel means of visualizing and interpreting art, providing students with alternative perspectives and methods to analyze and understand artworks. When used effectively, AI can enhance students' creativity and analytical skills, offering a complementary approach to traditional art history methodologies.

Looking ahead, there are several areas for future research that could further elucidate the role of AI in art history education. One key area is the development of more sophisticated AI algorithms that can better handle the complexities of art interpretation. Research could also explore the integration of AI tools in other aspects of art history education, such as in the study of iconography, art criticism, and art theory. Additionally, longitudinal studies assessing the long-term impact of AI tool usage on students' learning outcomes and understanding of art history would be valuable. Furthermore, exploring interdisciplinary approaches that combine AI with other technological advancements, such as virtual reality, could open up new frontiers in art history education. While AI tools present exciting opportunities for enhancing art history education, their integration requires careful consideration and strategic planning. Future research and development in this field should focus on overcoming the current limitations of AI technologies, enhancing their pedagogical application, and exploring innovative ways to blend these tools with traditional art historical methods. The ultimate goal should be to leverage AI not as a replacement, but as an enriching complement to the established practices of art history teaching and learning.

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