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Original Article

Integrating AI-Generative Tools in Web Design Education: Enhancing Student Aesthetic and Creative Copy Capabilities Using Image and Text-Based AI Generators

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Abstract - Artificial Intelligence (AI) is poised to disrupt all levels of education. The recent advances in the generative capabilities of new chatbots, AI art generators, and large language models have upended the art and design development pipeline. At the same time, the focus has remained on the nature of creativity and the role of humans in the creative process, prompting calls to ban AI art, bring lawsuits over copyright infringement, and demand universal watermarks to identify AI-generative content. Regardless of the outcome of such litigation, AI has already radically altered the workflow for artists and designers. This case study aims to demonstrate how AI can be practically applied and integrated into the web design UI/UX classroom. The proposed goal is not to replace the teaching of AI and Machine Learning (ML) but rather to provide web designers and developers with novel tools for creating innovative and creative content. The study was motivated by the varying levels of skill and experience among students in introductory-level web design and User Experience (UX) courses, and researchers postulated that both text-based and image-based AI generators could enhance students' aesthetic and creative copy capabilities. The results show that integrating AI tools into the web design and development workflow resulted in students reporting fewer deficiencies and producing better final projects. The study found that students found text-based generators particularly helpful in improving productivity and writing copy and code, while image-based generators aided in ideation and color selection.

Keywords - Human-machine interaction, Conversational AI, AI-generated art, AI application, AI technique

1. Introduction

Generative Artificial Intelligence (AI) tools such as Stable Diffusion and Lensa.ai have gained widespread popularity on social media, resulting in mainstream adoption [1]. However, traditional artists and designers have strongly resisted AI-generated art, citing copyright infringement and a lack of artistic merit [2-4]. Recent legal developments have also highlighted the challenges surrounding copyright protection for AI-generated art. In a landmark ruling on February 21, 2023, the U.S. Copyright Office limited the copyright protection for Kris Kashtanova's comic book, Zarya of the Dawn, which was illustrated using the text-to-image AI program, Midjourney, to the text and arrangement created by the author. The Midjourney-generated artwork was explicitly excluded, raising philosophical and practical questions about the role of AI in artistic creation and human creativity [5].

As AI technology continues to mature and become more widely available, concerns over widespread plagiarism have prompted calls for a ban on its use in higher education [6-7]. However, with Web 3.0 and 6G technologies on the horizon, which are set to revolutionize the internet with improved processing power and 3D generative technologies, integrating AI into curricula is crucial for preparing students for the future of web design, development, and UI/UX. Despite this, there has been a lack of interest from the academic community in exploring the practical applications and best practices for integrating AI into coursework, with much of the focus being on the theoretical and aesthetic implications of the technology's disruption [8]. Ajani's study on the role of human authorship in AI-generated content highlights the competing definitions of "art" as either an expression of technique or a display of sentiment (p.253). As a result, conversations have centered around the value of "art" in capturing the human condition versus demonstrating technical prowess [9-10].

While the valuation of AI and non-fungible tokens (NFTs) in the art world remains a topic of debate [11-12], the fact that AI has already disrupted the creative process of practicing artists cannot be overlooked [13]. AI art generators are affording artists with new and innovative solutions in their works, from suggesting new color palettes and compositions to creating entirely new forms of inspiration and iterative processes [14]. However, these use cases have yet to be fully explored, and critical and methodological approaches for interpreting AI-generated art are still being developed. Additionally, the potential impact of generative AI technology on the fields of web design and development has not been fully considered. While it is possible that coding will become a thing of the past and that we will instead drag and drop widgets and frameworks into a website, human expertise will still be necessary to adjust blocks of written content provided by AI and to ensure that the website is functioning properly [15]. Ultimately, the question remains whether websites will still be necessary, and it is clear that AI is a watershed moment for the fine arts and the creative process more broadly.

As such, this case study examined the potential application of both text-based and image-based AI generative content to improve computer science majors' understanding of the art and design process and to provide web designers and developers with new tools for creating innovative and creative content. The study aimed to enhance students' aesthetic and creative copy capabilities, given the varying levels of skill and experience among students in introductory-level web design and user experience (UX) courses. Results showed that integrating AI tools into the web design and development workflow resulted in improved final projects and fewer deficiencies reported by students. In particular, text-based generators were found to improve productivity and to write copy and code, while image-based generators aided in ideation and color selection. Unlike previous studies, more students appreciated the use of AI and found it useful rather than feeling that it replaced their creativity. In the case of UI/UX, AI was found to enhance productivity rather than creativity.

2. Literature Review

The use of generative artificial intelligence (AI) tools in contemporary art has sparked debates about the validity of AI-generated art and its impact on traditional artmaking practices in recent years [16]. This shift towards generative AI output has also raised poststructuralist considerations regarding the role of the artist and the corporeality of art [18]. This literature review aims to investigate the current scholarship and direction for studying the future of AI art, focusing on the impact of social media, fine art, and algorithms on how art is created and viewed. Additionally, the metaverse will be examined as a platform that breaks down traditional viewing dependencies and creates new possibilities for artists to engage with their audiences. Lastly, we will explore how the creative prompting process can reframe the association of creator and craft to elicit content in the viewer through a poststructuralist approach to meaning creation and reception theory.

While there are studies on the use of AI in the artmaking process, there has been little discussion of the practical applications, strategies, or workflows for practicing artists and designers to adopt. Prior literature has

instead focused on philosophical or theoretical discussions. Coeckelbergh [18], for instance, provides a conceptual framework for a philosophical discussion of whether machines can create art. This framework asks three questions: What is meant by "creation?" What is meant by "art?" And what is meant by machines "creating art?" The framing argues for an unstable and objective understanding of creativity, and the binary of human versus non-human forms of art is considered arbitrary. Rather, a collaborative definition is suggested, where technology assists in the creative process. Mazzone and Elgammal [19] also developed AI processes for identifying style and detecting large-scale style patterns in art history. They advocate for rethinking the connection between machine and human creativity "as parallel to but not in conflict with human artists and their emotional and social intentions of art making" (p. 1). Tao [20] refers to this partnership as the "actor-network" of art, where humans and machines work together as co-agents. The collaborative efforts of both parties could potentially maximize the strengths of each.

Other discussions have questioned the role of machines in the creative process and the idea of the process itself as creative. Ahmed [21], for example, framed the discussion of AI in terms of a design-based praxis out of the disciplines of the arts and humanities. The author argues that the permanent physical manifestations in media museums of AI should be understood not as a design but as a design. In reviewing interactive and immersive media installations, Ahmed argues that by making "immaterial humanistic characteristics" concrete and physical, including emotions, experiences, senses, and memories, AI should be reconsidered as more than a mere product or traditional image for a design (p.133). The interactions and emotions humans have when interacting with art generated by AI can be seen as a design element themselves. However, these considerations of AI and art do not address one of the most controversial notions of art- creativity.

The focus of the discussion around AI-generated art often centers on the concept of creativity and whether such art can be considered "art" proper. The model of creativity devised by Csikszentmihályi [22] involves a body of knowledge, a volitional agent, and experts in the field. Jennings [23] built on this model by identifying three criteria an agent must possess to qualify as volitional and featuring creative autonomy. When applied to AI art and "creativity," the author notes that creative autonomy represents the system's freedom to pursue a course independent of its programmer's or operator's intentions. However, Ajani [8] notes that creativity depends on individual capacity, acquisition of information, and judgment by experts. Since creativity must be externally validated, AI cannot inherently be considered creative in each domain (art and/or design) and must be judged by experts in the field.

The current state of research on AI-generated art highlights the need for further exploration of practical applications of these tools for artists and designers. With the increasing prevalence of generative AI tools, there is a call for the development of new pipelines for creating and interpreting generative content. A key area of focus is the creation of collaborative and co-creative processes that allow artists to partner with AI and expand its capabilities. Artists and designers must take a proactive approach to learn about the possibilities and limitations of AI-generated art to incorporate it in innovative and meaningful ways rather than relying on it as a novelty. Moreover, new frameworks for interpreting and evaluating generative content need to be developed, acknowledging that these works are the product of complex human-AI collaborative processes. This may require establishing new criteria for assessing the creativity and artistic merit of generative works and new methods for engaging audiences. By working across art and technology fields, artists can play a vital role in shaping the future of AI-generated art and unlock new opportunities for creative expression and meaning-making.

3. Methods

The mixed-methods study included data from surveys collected from students, instructor feedback and artifacts (AI-generative content and final website projects). The sample was collected from a private Midwestern college in the Saint Louis region. Participants included 26 undergraduate and graduate students majoring in

Computer Science, Computer Information Systems, Digital Marketing, Finance, Game Design, Marketing, and Art and Design enrolled in two sections of *Web Design I - User Experience*, the second course in a series that concentrates on web design and is project-based. It builds on advanced HTML and CSS, incorporating JavaScript, frameworks, and libraries to delve deeper into the world of web design, focusing on the user experience through a simulated client experience. Throughout the course, you will learn about content management systems (CMS) and develop the skills to configure, modify, and populate a site driven by a CMS. Additionally, you will learn about search engine optimization techniques and digital marketing strategies to promote and market your site effectively. The project aimed to assess pedagogical best practices for using text- and image-based generative AI for web design and development through student perceptions, performance, and feedback coupled with instructor feedback and observations.

The study consisted of two sections comprising both undergraduate and graduate students with a diverse range of majors, including graphic design, web design, and computer science. The course focuses on frameworks, libraries, and coding in JavaScript to teach students about both coding and design. However, students with a background in computer science tend to struggle with the design aspect of the course. The study aims to use AI as a tool to assist students in the aesthetic side of web design and content creation. Specifically, the study proposes using ChatGPT3 to generate temporary content that the client can later replace instead of using placeholders like Lorem ipsum. The study emphasizes that AI should be viewed as a tool rather than a replacement for traditional education, with the primary focus being on coding and functionality.

While the use of AI was not possible for coding due to certain frameworks, it can still be used for generating content and designing visuals for the site. Students were encouraged to explain in their assignments how they utilized AI in the creative process and include HTML comments identifying aspects of the assignment. The goal is to incorporate AI components as a part of the assignments and embrace the use of AI as a valuable tool for web design.

The study was structured as an eight-week course focused on web design that incorporated the use of AI. In the first week, students were introduced to the course and the topic of web design. In week two, students were required to watch a video outlining 11 different AI applications and how they can be used in web design. The students were then expected to utilize AI in making certain decisions. Week three was focused on the aesthetic part of the site, with students using AI for the iterative or formative phase of the process. The assignment was modified to include the use of Bootstrap.

In week four, students worked on a project for a client called Chef Cookiecutter. They were required to build a site and give a video report on where they were at, including the use of AI and how they were using it for this particular project. Although they were shown 11 applications, they were required to use four over the project and describe how they were used. Week five involved animating a logo inspired by or generated by AI, which had to be done per the client's request (Figure 1). Students were required to describe how they were using AI to animate the logo.

Week six was dedicated to presenting the project to the client and discussing the use of AI in the project. Students were also required to submit the project as a learning management system (LMS) submission with a live URL, noting how AI was utilized and why those applications were chosen (Figure 2). In week seven, students were asked to discuss AI and its impact on design. Finally, in week eight, students submitted their final project but were not required to mention AI (Figure 3). The data collected from surveys and the artifacts produced by students were evaluated to determine the effectiveness of using text- and image-based AI art generators in web design courses.

This project employed a mixed-methods approach to gather data on using text- and image-based generative AI in web design courses. The data collection included both qualitative (open-ended comments) and thematic (quantitative) results from an online survey conducted in the Spring of 2023. The survey instrument focused on the different methods for using AI tools and sought to inform the pedagogical considerations of future use of the emerging technology. After collecting the data, student demographics were gauged, feedback on the experience of using AI tools for coding, creating copy, and offering aesthetic inspiration and solutions for website creation, and student preferences for use cases of integrating AI-generative content in their workflow were evaluated. Students were also asked an open-ended question regarding their experience and what they felt AI was best suited to accomplish pedagogically.

To collect data, students were reached out to via the university's course management system or email with links to online surveys. The survey was accessible for one week at the beginning of the eight-week term and one week in the end, with all responses collected using Qualtrics to protect the privacy and anonymity of the participants. The data was sorted by demographics, including age, gender identity, and major, and exported from the survey system. Comparisons between groups were made using descriptive statistics. Furthermore, the artifacts created by the students were evaluated along with the survey results to gain further insight into the learning outcomes and receive more extensive feedback on their experiences. The combination of qualitative and quantitative data collection methods comprehensively evaluated the effectiveness of text- and image-based AI art generators in web design courses.

4. Results

The demographics of the study participants were analysed to gain insights into the characteristics of the sample. A total of 33 participants were included in the study, representing a range of academic levels and backgrounds. In terms of academic level, the participants consisted of first-year students (6.06%, n = 2), sophomores (24.24%, n = 8), juniors (36.36%, n = 12), seniors (27.27%, n = 9), and graduate students (6.06%, n = 2). These results indicate a diverse representation of students across different stages of their academic journey. Regarding age distribution, the majority of participants fell within the 18-24 age group (69.69%, n = 23). A smaller portion of participants belonged to the 25-34 age group (21.21%, n = 7), while the 35-44 age group represented 9.09% (n = 3) of the sample. Participants aged 45 or older did not appear in the study. Regarding gender identity, 54.55% of participants identified as male (n = 18), while 45.45% identified as female (n = 15). None of the participants identified as non-binary or preferred not to say. The majority of participants (93.94%, n = 31) indicated that they were not Hispanic/LatinX, while a small percentage (6.06%, n = 2) identified as Hispanic/LatinX. Regarding race/ethnic heritage, the sample consisted of participants from diverse backgrounds. The largest group identified as White/Caucasian (54.54%, n = 18), followed by Black or African-American (27.27%, n = 9) and Asian (18.18%, n = 6). No participants identified as American Indian or Alaskan Native, Native Hawaiian or Pacific Islander, or Other.

Table 1. Results of diverse representation of students across different stages of their academic journey

Participants Details	No. of Participants	Percentage of Participants
First Year Students	2	6.06%
Sophomores Students	8	24.24%
Juniors Students	12	36.36%
Seniors Students	9	27.27%
Graduate Students	2	6.06%

Table 2. Participants in age wise

Age	No. of Participants	Percentage of Participants
18-24	23	69.69%
25-34	7	21.21%
35-44	3	9.09%
45 Above	0	0%

Table 3. Participants in gender wise

Gender	No. of Participants	Percentage of Participants
Male	18	54.55%
Female	15	45.45%

Table 4. Participants in language wise

Language	No. of Participants	Percentage of Participants
Not Hispanic/LatinX	31	93.94%
Hispanic/LatinX	2	6.06%

Table 5. Participants in race/ethnic heritage wise

Race/Ethnic Heritage	No. of Participants	Percentage of Participants
White/Caucasian	18	54.54%
Black or African-American	9	27.27%
Asian	6	18.18%
Other	0	0%

Additional demographic information was collected to provide a comprehensive understanding of the study participants. Regarding international student status, the majority of participants (81.81%, n = 27) indicated that they were not international students, while a small percentage (18.18%, n = 6) identified as international students. Participants were also asked about the highest level of education an immediate family member attained. The responses varied, with 3.03% (n = 1) indicating that no one in their family had any college education, 15.15% (n = 5) stating that a family member completed some college credits but did not finish their degree, 48.48% (n = 16) reporting that a family member completed an undergraduate degree, 30.30% (n = 10) indicating that a family member completed a master's degree, and 3.03% (n = 1) stating that a family member completed a doctoral degree. Participants were also asked about their residential status, with 66.67% (n = 22) identifying as commuter students (living off-campus) and 33.33% (n = 11) as residential students (living on-campus). In terms of how participants primarily take classes, 60.60% (n = 20) reported taking classes online, 21.21% (n = 7) stated that they primarily have face-to-face classes, and another 18.18% (n = 6) mentioned taking hybrid classes.

Table 6. Participants in international wise

Internationality	No. of Participants	Percentage of Participants
Non-International	27	81.81%
International	6	18.18%

Table 7. Participants in highest level of education an immediate family member attained wise

Level of Education	No. of Participants	Percentage of Participants
No college	1	3.03%
College - Not get degree	5	15.15%
UG	16	48.48%
PG	10	30.3%
Ph.D	1	3.03%

Table 8. Participants in residential wise

Residential Area	No. of Participants	Percentage of Participants
off-campus	22	66.67%
on-campus	11	33.33%

Table 9. Participants in primarily take classes attained

Class	No. of Participants	Percentage of Participants
Online	20	60.60%
Offline	7	21.21%
Hybrid	6	18.18%

Finally, the study included participants from various majors. The most common major among the participants was Computer Science (20.69%, n = 6), followed by Art and Design (10.34%, n = 3) and Computer Science (BS) and Computer Science (BA) with equal representation at 10.34% (n = 3) each. Other majors, such as Art and Design (BFA), Art and Design (MA), and Digital Marketing (BS), had smaller representations ranging from 3.45% to 6.90% (n = 1-2). These majors were taken into account in the subsequent analyses to explore potential differences in the outcomes based on participants' areas of study.

Table 10. Participants according to their majors

Major	No. of Participants	Percentage of Participants
Computer Science	6	20.69%
Art and Design	3	10.34%
Computer Science (BS)	3	10.34%
Computer Science (BA)		
Art and Design (BFA)	1-2	3.45% – 6.90%
Art and Design (MA)		
Digital Marketing (BS)		

Participants' perceptions and use of AI in the class were assessed through several questions. The majority of participants responded positively to the integration of AI exercises as part of the design process in class (69.69%, n = 23), indicating that they liked these exercises. A smaller proportion of participants expressed their dislike (18.18%, n = 6), while some remained undecided (12.12%, n = 4).

Table 11. Responses from participants about AI exercises

Reponses	No. of Participants	Percentage of Participants
Liked	23	69.69%
Disliked	6	18.18%
Undecided	4	12.12%

When asked about the benefits of AI exercises in the design process, the majority of participants reported that they found them beneficial to their success in the course (78.78%, n = 26). A smaller percentage indicated uncertainty (12.12%, n = 4), and only a few participants did not perceive the exercises as beneficial (9.09%, n = 3). Regarding the use of specific AI applications, the majority of participants experimented with text-based AI generative content, such as ChatGPT3 (78.78%, n = 26), while a smaller proportion did not (21.21%, n =7). Similarly, a high percentage of participants utilized AI applications to aid in creating image-based content (87.87%, n = 29), while a smaller proportion did not (12.12%, n = 4).

Table 12. Responses of participants about benefits of AI exercises

Reponses	No. of Participants	Percentage of Participants
Success	26	78.78%
Not Perceive	3	9.09%
Uncertainty	4	12.12%

Table 13. Responses of participants about experimented with text-based AI generative content

Reponses	No. of Participants	Percentage of Participants
Chat GPT3	26	78.78%
Did Not	7	21.21%

Table 14. Responses of participants about participants utilized AI applications to aid in creating image-based content

Reponses	No. of Participants	Percentage of Participants
AI Utilized	29	87.87%
DID NOT	4	12.12%

Furthermore, a significant percentage of participants incorporated AI applications into their final projects (87.50%, n = 28), highlighting their active use of AI in their creative work. Among those who used AI applications, a variety of approaches were observed, including using text-based generative AI, image-based generative AI, or a combination of both. Additionally, many participants reported using AI tools to find inspiration to help create content themselves.

When asked about the impact of AI applications on their final projects, the majority of participants believed that it improved their projects (78.78%, n = 26), indicating a positive perception of the contribution of AI to the final outcomes. Some participants expressed uncertainty (6.06%, n = 2), while a small percentage did not feel that AI improved their final projects (15.15%, n = 5).

Table 15. Responses of participants about the impact of AI applications on their final projects

AI improved their final projects	No. of Participants	Percentage of Participants
Improved their final projects	26	78.78%
Uncertainty	2	6.06%
Not Improved their final projects	5	15.15%

Participants provided valuable insights on how AI applications improved their final projects. One participant mentioned, "It made me think outside of the box more," highlighting how AI sparked creativity and encouraged innovative approaches to design. Another participant noted the benefits of AI in image optimization and code structure, stating, "Image optimization and code structure." The efficiency gains were emphasized by a participant who said, "It took me less time to debug and also allowed me to generate the output of an idea quickly." While

some participants acknowledged that AI did not necessarily improve their final projects directly, they recognized its value in generating ideas and facilitating new designs. As one participant explained, "I don't think it improved my final project, but it definitely helped me to have more ideas and new designs." Additionally, participants appreciated that AI freed up their time to focus on other aspects of their projects, as expressed by one participant who mentioned, "It improved my work by allowing me to focus on other elements besides the AI-generated content." These insights highlight the diverse benefits of AI applications, including enhanced creativity, time savings, and support in overcoming design challenges in web projects.

Participants expressed positive attitudes towards using AI tools to improve their designs in the future. When asked if they could see themselves using similar tools, 68.75% responded affirmatively. Participants recognized the potential benefits of AI in their design process, with one participant stating, "It makes things go a lot faster because sometimes I get stuck on a block of code, and it is hard sometimes to read the documentation." This sentiment highlights the time-saving aspect of AI tools in assisting with design challenges.

In terms of the ways AI applications may improve the design process, participants ranked suggesting creative solutions as the most prominent (36.67%), followed by assisting with writing code (20.00%) and assisting in creating new ideas (20.00%). Participants also acknowledged the value of AI tools in organizing existing ideas, better understanding AI in general, and leveraging emerging technologies in design. However, the idea of AI tools providing a scientific approach to design received the lowest ranking.

Opinions were divided on whether AI art tools should be considered comparable to Adobe Photoshop and other digital imaging tools. 37.50% agreed, 34.38% disagreed, and 28.12% were uncertain. When asked if students should be able to use AI tools to assist in ideation and formative steps in the design process, 78.13% responded positively. Similarly, 65.63% believed that students should be able to use AI tools to complete and submit final works for classes.

Table 16. Opinions of participants were divided on whether AI art tools should be considered comparable to adobe photoshop and other digital imaging tools

Opinions	Percentage of Participants
Agree	37.50%
Disagree	34.38%
Uncertain	28.12%

In terms of specific reliance on AI in the design process, participants highlighted the formative stage for ideation (29.03%), utilizing AI at the intermediate stage to generate imagery for the website (38.71%), and using AI at the intermediate stage to write copy for the website (25.81%). These responses illustrate the various points at which participants integrated AI into their design process, emphasizing its utility in generating ideas and creating visual content.

Table 17. Response of participants integrated to AI tools assist in their design process

AI in Design Process	Percentage
Formative stage for ideation	29.03%
Intermediate stage to generate ideas for Website	38.71%
Intermediate stage to create visual content for website	25.81%
Positive response in ideation and formative steps	78.13%
Completion and final submission of work	65.63%

The final section asked participants for any additional thoughts they had about using AI for learning web design and UX. Students expressed a positive sentiment towards using AI in teaching and learning web design and user experience (UX). One participant stated, "AI is a good tool, and I think it should keep being used." Another participant acknowledged the limitations of AI in generating original ideas, saying, "Honestly, it is difficult to create new ideas with AI because AI collects existing pieces of work. So students should consider the use of AI." Participants recognized the benefits of AI in saving time and providing quick solutions when feeling stuck. As one participant noted, "AI tools can help us save time when it comes to large projects and give fast ideas and solutions whenever you are stuck." However, participants also emphasized the importance of not overly relying on AI and using it as guidance for new ideas. One participant commented, "You cannot rely on them, so the best way to use them is as guidance for new ideas."

Some participants highlighted the need for teaching students how to ask better questions and develop detailed prompts to maximize the use of AI in web design and UX. One participant stated, "With the emergence of AI assistants that can create virtually any content, it is important for professors to teach students how to ask better questions and how to develop well-rounded and detailed prompts to maximize the use of AI in web design and UX." Another participant expressed gratitude for the inclusion of AI in the coursework, stating, "Before this class, I had no idea that people even used AI for web design, so including it, in the course material was extremely beneficial to me."

While opinions varied on the extent to which AI should be relied upon, participants recognized the growing significance of AI and its potential to enhance their skills and future prospects. One participant expressed a balanced view, saying, "I am still on the fence. I am fine with AI providing some help, but I still feel the majority of work should be done by the student." Another participant highlighted the advantage of learning to use AI technologies, stating, "AI is not going anywhere. I have been pleasantly surprised by the inclusion and encouragement of its use in coursework. In my opinion, this will give students an edge by knowing how to use these technologies to their advantage." In all, participants acknowledged the value of AI as a tool in web design and UX education, recognizing its benefits in saving time, generating ideas, and enhancing creativity. While cautious about relying too heavily on AI, participants appreciated its inclusion in coursework and its potential to provide them with a competitive edge in the field.

4.1. Instructor Observations

Instructor feedback on the use of AI in the course was positive and focused on the potential and benefits of AI tools. One of the most helpful strategies carried out by the instructor was to first "Demo the generative AI a bit" to showcase its capabilities to the students. Also, the use of AI was not required or explicitly asked for in the final projects, yet almost all students chose to use AI tools. The instructor felt that the final projects were improved as a result, as did the students, who also agreed that incorporating AI in the future could further enhance their own designs.

Formative and summative feedback provided by instructors also addressed the usage of AI in the design process. The instructors talked about the use and ethics of AI at the end of the course, emphasizing the importance of training students on AI and discussing ethical considerations. Moreover, the instructor recommended future use cases for others introducing the assignment to avoid initial negative bias and instead focus on showcasing the positive applications of AI. In other words, institutional culture and messaging around AI need to be reconsidered to change the context of working with the tools, granting permission to use and showing that it is not only encouraged but expected.

Several quotes from the participants in the study reflected their positive experiences and perspectives on using AI in web design and UX. One student expressed, "Before this course, I was hesitant to explore the use of AI because I had only heard negative things, and honestly, it creeped me out. I am grateful we were encouraged to try

AI in the assignments and projects." Another student mentioned, "I think there is great potential to use AI in a positive manner, especially when prototyping."

Such positive affirmations for the use of AI likely derived from the manner in which the instructor approached each assignment. For instance, the instructor provided extensive instructional demonstrations on how to use AI tools for image generation, colour palette creation, textual content creation, logo ideation, and more. Because the instructor did not dive into the potentially negative considerations of the use of generative AI, students were instead able to focus on the potential benefits of the tools. Rubrics were also modified to reflect the inclusion of AI when applicable and encouraged students to experiment with AI in their assignments.

The overall sentiment from instructor feedback and participant quotes highlighted the positive impact of incorporating AI in the teaching and learning of web design and UX. The instructor demonstrated the capabilities of AI tools and encouraged their use, resulting in improved final projects. Participants expressed their initial hesitations but appreciated the convenience, time-saving, and creative possibilities AI brought to their design process. The emphasis on ethics, training, and positive applications of AI helped create a supportive learning environment.

5. Conclusion

The integration of AI-generative tools into art and design education holds great potential to enhance the creative process. This study has shown the usefulness of AI in web design and user experience courses, particularly for students from diverse backgrounds. While further research and development are necessary to optimize the use of these tools, the findings highlight their impact on the creative process. At the same time, it is crucial to recognize that AI should not replace artists but instead serve as a tool to enhance and complement their work. Ethical considerations and copyright issues related to AI-generated content must be addressed in art and design classes [24]. As the field evolves, educators should re-evaluate the role of artists, shifting the curriculum's focus from technical construction to the conceptual framework of creativity.

Future research should explore the aesthetic and coding potential of AI-generative tools and the proper use of text prompts for AI-generated art. Understanding and anticipating the outcomes of different ideation processes are important areas of investigation. Artists should have the ability to manipulate algorithms, paving the way for new creative possibilities. Governing organizations like NASAD should provide best practices for integrating these tools into the curriculum. Furthermore, the study has demonstrated the usefulness of AI tools in enhancing web design skills, and further integration into the curriculum should be considered as these tools continue to evolve. With the launch of ChatGPT-4 and its new capabilities, the potential of AI tools to enhance the creative process is accelerating. The ongoing exploration and utilization of AI in art and design education will shape the future of the field, empowering artists with new tools and opportunities for creative expression.

Appendix

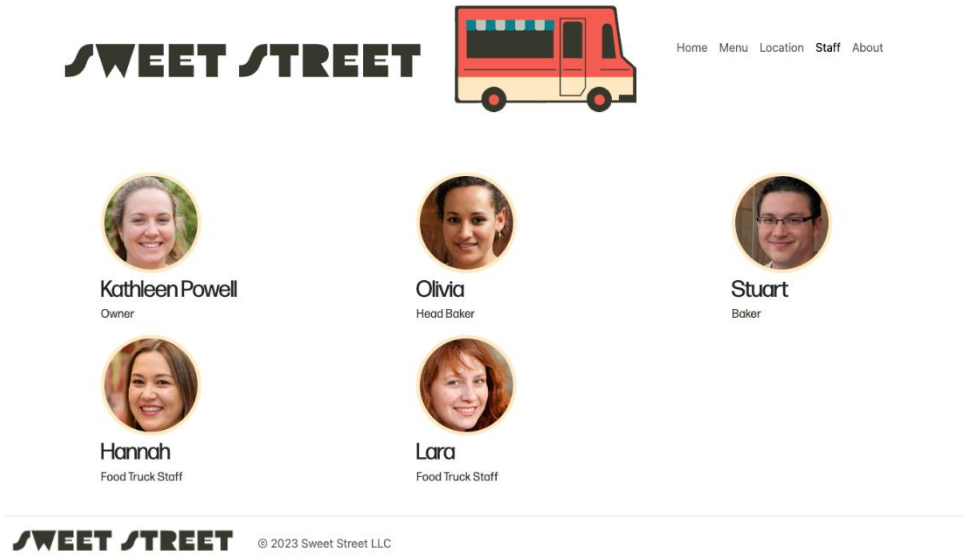

Fig. 1 Student animated logo example assignment

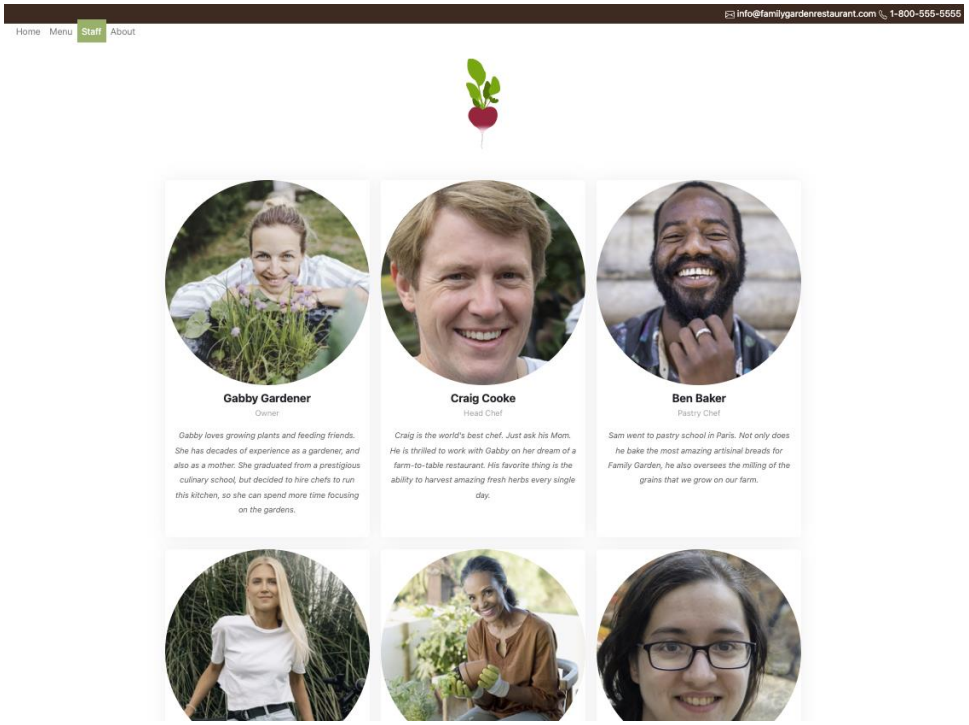

Fig. 2 Student example of AI-generated employees

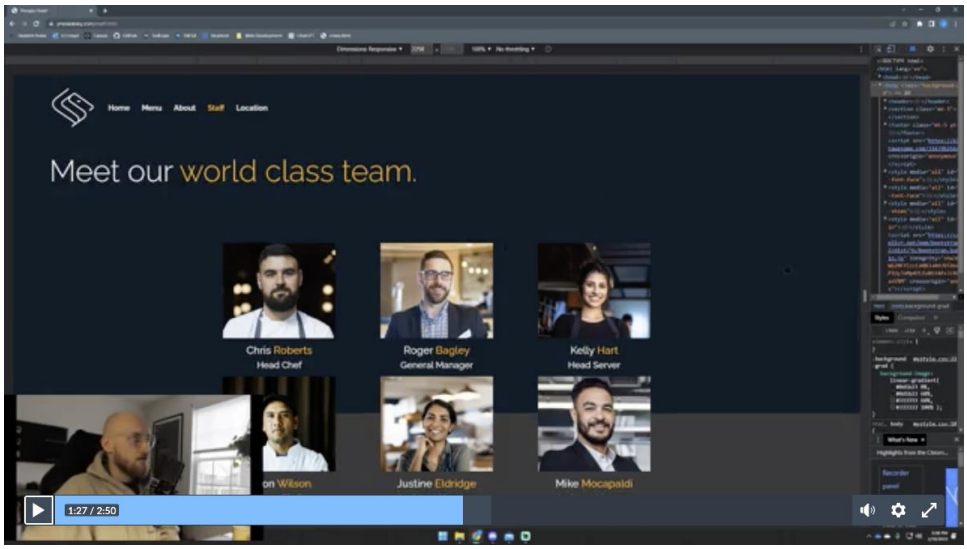

Fig. 3 Student example of final website walkthrough

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