AI Image-Generation as a Teaching Strategy in Nursing Education

JANET REED
Kent State University, USA
jreed56@kent.edu

BRITTANY ALTERIO
Kent State University, USA
balterio@kent.edu

HANNAH COBLENZ
Kent State University, USA
hcoblent@kent.edu

TAYLOR O’LEAR
Kent State University, USA
tolearl@kent.edu

TOMEK METZ
Kent State University, USA
tmetz6@kent.edu

Generative artificial intelligence (AI) allows for the transformation of written text into artistic images of varying styles. Scholars and researchers are beginning to explore the benefits of this technology to improve reflective practices and critical analyses in education. The extent to which AI-generated images can be used in nursing education (e.g., to explore cultural stereotypes or visual representations of the nursing profession) has not yet been studied. This article describes a case study of using generative-AI images created by Midjourney with undergraduate nursing students to examine their per-
ceptions and fears of the nursing profession. The research explored how students experienced the process of using AI-generated art as a teaching and learning tool to increase their reflections and discussions on professional nursing topics. Images were used to encourage introspection, collaborative reflection, and discussion on nursing topics. Results of this qualitative, exploratory study point to pedagogical and technological outcomes of using AI image-generation as a strategy to encourage reflection and discussion on student’s perceptions and fears of the nursing profession. Implications for research and practice are discussed.

Keywords: generative artificial intelligence, image-generation, Midjourney, nursing education

Artificial intelligence (AI) involves behaviors that are performed by computers meant to mimic and extend human thinking and action (Masters, 2019). It is increasingly being used in society; it is changing the way humans interact with the trillions of pieces of data that exist globally. AI is also becoming more prominent in healthcare. For instance, AI-based technologies are increasingly being used in integration with electronic health records, medical chatbots, and virtual nursing assistants (Lee & Yoon, 2021). By using AI to help evaluate large amounts of health data, doctors and nurses can be freed up to spend more time with patients (Kreutzer & Sirrenberg, 2020).

Given the current importance and ubiquity of AI in healthcare, nursing students must be prepared during their educational training to interact and use AI technologies in meaningful and ethical ways. Unfortunately, very few nursing students get the chance to interact with AI in nursing curricula (Kwak et al., 2022). Little has been published on the use of AI in nursing education, but research has shown that negative attitudes about AI can result in lack of technological integration (Shang, 2021; von Gerich et al., 2022). There is, therefore, a pressing need to stimulate and increase technological adoption of AI in nursing education (Ronquillo et al., 2021).

Generative-AI uses deep learning models and algorithms based on existing data to create new data such as images or text (Lim et al., 2023). Though all types of AI should be explored, generative-AI specifically for image creation holds potential to be used in nursing education to explore issues surrounding students’ reflections on the image of nursing and students’ professional identity development. Challenges surrounding inaccurate or stereotypical views of the nursing profession have been well documented...
and can result in recruitment and retention problems (Huston, 2020; Price & McGillis-Hall, 2014). Unfortunately, very few research studies have examined AI or generative AI in nursing education (Hwang et al., 2022); moreover, as of the publication date of this article, no studies could be identified that used generative-AI images within nursing education. Therefore, the purpose of this study is to explore the use of generative-AI through Midjourney as a teaching strategy to encourage students’ reflections on their perceptions of the nursing profession. The following research questions guided this study:

- **RQ1**: What are the outcomes of using AI-generated art to increase students’ reflections and discussions on professional nursing topics?
- **RQ2**: What are the pedagogical and technological outcomes of using generative AI to reflect on the nursing profession?

**LITERATURE REVIEW**

A literature review was completed to further explore the use of art in nursing education, the public image of nursing, and how generative AI has been or could be used in nursing education.

**Arts-Enriched Pedagogy**

The prevalence of social media and internet use in our culture leads to continual image consumption. Given this presence, along with decades of research on the value of visual thinking, teachers across all content areas are being called upon to adjust their methods to cultivate more visual thinking in learners (Amit et al., 2017; Fernández-Fontecha et al., 2019). Arts-enriched pedagogy is a method of teaching in which students learn about topics through the process of creating or responding to artwork (Rieger et al., 2016). The use of artistic images specifically in healthcare education has shown positive effects on students’ self-awareness, communication, critical inquiry, dialogue, and depth of reflection—all of which are essential to building clinical judgment (Andersen et al., 2022; de la Croix et al., 2011; Lapum & St-Amant, 2016; MacDonnell & Macdonald, 2011). Though limited work has been done with art in nursing education, several researchers have noted the positive emotional benefits of incorporating arts-enriched pedagogy into the education of nursing students. Frost (2019)
was able to use art to assist undergraduate nursing students in processing their emotions via emotional debriefing after clinical experiences, a process that may help build resilience. The use of art to channel feelings to manage emotions was a similar theme found by Andersen et al. (2022), who used art in simulation debriefing to increase students’ reflections. Helping students be self-aware and regulate both positive and negative emotions can lead to higher emotional intelligence, which has been linked to greater success in nursing school (Sharon & Grinberg, 2018). Nurses who are emotionally intelligent perceive themselves as more optimistic, and they are better able to understand, manipulate, and regulate their emotions. Emotional intelligence is also considered a way to help a person more easily adapt to challenges which can mitigate burnout in healthcare workers (Daud et al., 2022; Raghubir, 2018). The links between art, emotional processing, and reflection can make the use of images a powerful teaching strategy to give students meaningful experiences that they will remember during their education which can help build emotional intelligence.

Images of Nursing

An image can be defined as a visual representation of a mental picture or impression of something (Merriam Webster Online Dictionary, 2023). The public image of nursing is a significant problem that can negatively affect the recruitment and retention of future nurses (Price & McGillis-Hall, 2014). By 2030, a worsening shortage of nurses will lead to a global deficit of thirteen million nurses (ICN, 2021). For decades, nursing has had a public image crisis, with media portrayals of nurses often being inaccurate, negative, and stereotypical, all leading to a host of problematic consequences for nurses’ professional identity development (Huston, 2020). This is often highlighted in TV shows, movies, and in mainstream media, which often fail to credit nurses for the work that they do (Summers & Broome, 2019).

Some researchers have tried to address these issues by examining mental representations of the image of nursing through qualitative methods like analyzing written text and student interviews (Cirik et al., 2022; Lyckhage & Pilhammar, 2008). For instance, in a mixed method study of 1556 university students, Cirik et al. (2022) found that nursing was “perceived as an uneducated, female and sexualized profession where nurses are subordinate to physicians and chose their profession due to family pressure or for economic gain” (p. 9). These harmful misperceptions can influence students’ career choices and worsen the nursing shortage. Conversely, by detecting mental
representations of nursing, changes can be made to improve nursing’s professional image in society. Consequently, educational strategies are urgently needed to promote a realistic and positive image of the nursing profession to the next generation of potential nurses (Norman, 2015).

The public image of nursing is closely linked to and can influence the concept of professional identity development in nursing (Joseph et al., 2021; ten Hoeve et al., 2014). Professional identity in nursing can be defined as “a sense of oneself, and in relationship with others, that is influenced by characteristics, norms and values of the nursing discipline, resulting in an individual thinking, acting and feeling like a nurse” (Godfrey & Young, 2020). The development of professional identity is significant because it is linked to nursing competence and patient outcomes (Vabo et al., 2022). Nursing students start to develop professional identity in nursing school by merging the core values, beliefs, and ethics of the profession into their sense of oneself through engagement with other students, nursing faculty, and patients (Fitzgerald, 2020). This process encompasses individual and group values, beliefs, attitudes, and behaviors that are often determined through reflective practices (Vabo et al., 2022) and guided by role models (Matthews et al., 2019). Generative AI holds potential to help nursing educators in this endeavor by providing visual insight into student and cultural perceptions of the profession of nursing as well as opportunities for reflection.

**Generative AI in Nursing Education**

Generative AI is a type of AI that learns how to take actions from past data in order to create brand new content such as text (e.g., ChatGPT), or images (e.g., Midjourney, Dall-E 2). Lim et al. (2023) defines generative AI as “a technology that (i) leverages deep learning models to (ii) generates human-like content (e.g., images, words) in response to (iii) complex and varied prompts (e.g., languages, instructions, questions)” (p.2). Several prominent image-generation-AI platforms for creating art include Midjourney, Dall-E 2, and Stable Diffusion; these can create stunning, never-seen-before images in mere seconds using text inputs from the user. Leveraging generative-AI, teachers can now have an easily accessible tool to bring students words and mental representations to life in visual form.

The rise of generative AI has created many conflicting opinions; lawyers, educators, and artists disagree on its ethical use, even questioning the very nature of art itself (Plunkett, 2022). The paradoxical relationship between generative AI and education is that it creates both challenges and op-
opportunities. Its paradoxes have been described as “friend or foe,” “capable yet dependent,” and “accessible yet restrictive” (Lim et al., 2023, p.1). For instance, while humans can co-create images for instruction and reflection (Kelly, 2022), generative AI can also lead to deepfakes—images or recordings that have been altered to misrepresent someone as doing or saying something that was never done (Campbell et al., 2022). It also has latent biases such as racial and gender biases, as well as representation bias which happens when the data is not representative of the real world (Srinivasan & Uchino, 2021).

Given these concerns, many educational institutions have banned generative AI (e.g., ChatGPT). However, technology experts are urging schools to train teachers and students how to responsibly and ethically use artificial intelligence (Jimenez, 2023). By embracing generative AI as an opportunity, education could theoretically be transformed for more personalized learning (Dilmegani, 2023). And AI-image generation can quickly produce images which reflect the user as well as the culture’s views on a subject.

Generative AI holds potential to transform many practices in nursing education such as creating patient care plans (Gapp, 2023), improving students’ writing (Frith, 2023), enhancing communication skills (Panke, 2023), virtual simulation (Lebo & Brown, 2022), and creating meaningful learning experiences for students to increase reflection and clinical judgment (Reed, 2023). Sun and Hoelscher (2023) called for nurse educators to become more familiar with the benefits and limitations of using AI technologies (e.g., ChatGPT for nursing); they also suggested that educators create assignments focused on self-reflection and independent learning. Educators who understand generative AI will be better equipped to provide high quality, personalized learning experiences which prepare students to ethically use this technology in the future. As healthcare becomes more data driven (i.e., using AI to analyze data in electronic health records to predict patient outcomes), nurses need to have a better understanding of the capabilities, limitations, and ethical considerations for using AI (Jeong, 2020).

In summary, considering the need to increase student’s engagement with AI technologies and the positive benefits of arts-based pedagogy to assist in students’ professional identity development, generative AI holds significant promise for nursing education. However, research on the use of generative AI in nursing education is very much in its infancy. No research articles could be found specifically using generative AI for image generation in nursing education, highlighting the gap in the literature on this emerging technology. Therefore, the purpose of this study was to explore the teaching strategy of having students reflect on their perceptions and fears of the nursing profession by using generative-AI images through Midjourney.
**METHOD**

Using an exploratory descriptive qualitative case study design, four senior-level undergraduate nursing students (co-authors of this article), participated in this IRB-approved study at a public Midwestern university. Constructivism underlies the basic premise of this study, analyzing how people interpret and make meanings of their experiences and acknowledging that multiple realities are co-constructed from various individuals’ vantage points (Merriam & Grenier, 2019). Students from a senior level nursing course (not taught by the principal investigator) self-selected to participate; they were recruited using a scripted email invitation. The sample consisted of three female students and one male student, all Caucasian, and all senior-level undergraduate nursing students.

**Procedures**

*Step 1: Prompts and Creation of AI-Images.* After informed consent was obtained and demographics collected, then students were asked to provide written responses in Qualtrics to several discussion prompts to help them reflect on their professional identity development in nursing. The three prompts included:

1. Describe the nursing profession.
2. Describe why you want to be a nurse.
3. Describe your biggest fears about becoming a nurse.

Students were asked to provide 3-5 sentence responses for each of these descriptive prompts. Due to the primary investigator’s familiarity with the program, *Midjourney* was used to create the AI-generated images. *Midjourney* is accessed through the gaming platform *Discord*; it creates a series of four photos in response to text inputs. Because the image-quality decreased when long paragraphs were copied verbatim, 5-10 keywords were chosen from the students’ written responses to create the AI-generated images. Additionally, a bias was noted in the AI-system that whenever the word *nurse* was entered as a prompt in *Midjourney*. More specifically, the image would consistently display a female gendered nurse. Therefore, in order to support diversity and inclusion, the students’ self-reported gender identity that was collected in demographics was used as a precursor to the word *nurse* in the *Midjourney* prompt (i.e., male nurse). This allowed stu-
dents who reported a gender-identity other than female to better relate to the images.

**Step 2: Reflection Questions on the AI- Generated Images.** The AI-generated images were then presented back to the students for individual reflection. Students were asked to write about their reactions and thoughts of the images individually. These responses were used for qualitative data analysis to answer the research questions. The following four reflection questions were used:

1. What were your initial thoughts or reaction to creating AI-images of the nursing profession?
2. How did seeing these images make you feel and what was your reaction to them?
3. Do you believe these images reflect your words describing the nursing profession? Why or why not?
4. What did you learn from going through this process?

**Step 3: Collaborative Group Reflection and Member Checking.** Lastly, students were brought together with the researcher for a group collaborative reflection. Student reflections and images were analyzed during the group meeting using basic interpretive qualitative research methods which seek to understand practices, experiences, and processes in the natural world and the meanings that people attribute to these (Merriam & Grenier, 2019). During the group meeting, students were asked to examine written reflections and resulting images that were created by every member. Then, students were asked to reflect on and discuss the emerging themes. All emerging themes were member-checked with the student participants for accuracy given constructivism served as the theoretical backing for this research and because all participants were co-constructing meaning with the researcher. Since. Having collaborative reflection in the group setting allowed students to re-evaluate their initial reactions and challenge their thinking as they heard from their peers.

**Data Analysis**

Data collected were qualitatively and systematically analyzed using the constant comparative method (Glaser, 1965). This method is an iterative, inductive process of reducing the data through constant comparison of new
data with previously collected data to develop categories or themes (Fram, 2013). Student reflection responses were read individually first, then globally based on individual questions for emerging themes that were reiterated in multiple student responses. Emerging themes were compared to all student responses and member-checked with student participants during the group collaborative reflection meeting. No new themes emerged during this time, but previously identified themes were confirmed with participants.

**RESULTS**

The first research question asked: How do students experience the process of using AI-generated art as a teaching tool to increase students’ reflections and discussions on professional nursing topics? Four senior-level undergraduate nursing students answered four reflection questions after they were presented with their AI-generated images. Here are the students’ responses in their own words along with their corresponding images.

**Q1. What were your initial thoughts or reaction to creating AI-images of the nursing profession?**

*Hannah:* When I first heard about this research opportunity, I did not have a good understanding about what AI was and what results to expect. Every nursing student has their own unique thoughts, feelings, and fears about becoming a nurse. Sometimes it is hard to understand our emotions and determine how to turn them into something productive. I never thought of AI as something that could show emotion or be personal. I jumped into the study without really understanding the purpose behind it, but I ended up learning a lot and expanding on my thoughts and feelings towards nursing that I did not know I had.

*Tomek:* I was interested in how AI would interpret nursing phrases. I thought that AI could get close to replicating different types of media, but it never felt the same compared to the work of a human. I wondered how AI could represent my feelings and emotions about nursing. There is potential that AI images could help students think about nursing differently as well as their emotions relating to nursing.

*Brittany:* When I initially learned about creating AI-images of the nursing profession, I did not really know what to expect for the outcome. I admittedly knew the bare minimum about AI before this activity, but I did not
really understand how it could be used in nursing education. However, after viewing the images and experiencing how they prompt self-reflection, I think they should be regularly included in the nursing curriculum.

Taylor: When I originally received the information about using AI technology in order to generate images of the nursing profession, I thought that the images would be stereotypical in a way, lacking the emotional component of nursing within the images. I also believed that it would be hard to capture complex aspects of the nursing profession in singular images. However, I was excited to see what AI technology could do in generating these images, but I just felt they would lack the emotional component that I find to be extremely important in the nursing profession.

**Q2. How did seeing these images make you feel and what was your reaction to them?**

Hannah: The images that reflected my fears seemed the strangest to me because of all the words and writing that did not make sense. Every image was of a person yelling (see Figure 1). My fear was about losing my license, which is probably why one of the images had a person holding up a piece of paper. I think my fear is based around being punished for making a mistake and the expectation to be perfect to hold a job. Some images seemed odd and repetitive. I think allowing students to adjust their words to create better images would help create more accurate results that will be more effective. It was intriguing to see the stereotypes of our society weaved within our images.

Tomek: My initial reaction to the images was that they were strange. The image that was supposed to represent our fears in nursing had a man’s head coming out of a mirror and screaming (see Figure 2). Some others had random letters in the background. Some images showed technology that looked futuristic or from the past. Overall, I think that it was good to reflect on some questions I have not been asked since starting nursing school, such as why I want to be a nurse. I feel that I have been so caught up in what I am doing that I forgot why I was doing it. I reflected on what qualities I want to have and what qualities to avoid.
Figure 1

Hannah’s Images for the “Fears of Nursing”
Brittany: A lot of the pictures focused on humanity and the good of the nursing profession, so they made me feel hopeful that I can make a difference. I also felt a little bit disappointed that staffing and time constraints often prevent the type of nurse-patient relationships depicted in the images. It felt very idealistic rather than the real world (see Figure 3).
Taylor: When I saw the images for the first time, I was genuinely surprised at the internal feelings they created for me. They were so inspirational and really touched me because they brought my words to life. I do feel as though some of the generated images reproduced stereotypes. However, the majority of the images reflected exactly what I was thinking mentally and put my thoughts and emotions into an actual image. I felt that the coloring, facial expression, and positioning of the patients within the images were perfectly executed. I was pretty shocked at this realization, and seeing my words translated into meaningful images actually brought up a certain level of emotion within me (see Figure 4).
Q3. Do you believe these images reflect your words describing the nursing profession? Why or why not?

Hannah: Some of the images were personable and relatable, and others seemed ordinary, generic, and repetitive. The images that were generated based on why I want to be a nurse were bizarre but thought provoking. I talked about my dad having heart failure and my personal experiences of being in and out of the hospital during high school. These images seemed very futuristic, and some had objects that were unidentifiable (see Figure 5). But each one of them captured a lot of emotion and the exhaustion that comes with being a nurse and being a patient.
Figure 5

Hannah’s Images for “Why I Want to Be a Nurse”

Tomek: For the “why I want to be a nurse” section, I thought my description had more to do with the patient, which was not pictured in the images, but only the nurse with strange letters (See Figure 6). In my fears of nursing section, I feel the images of nurses screaming could represent internal fear, but I do not think I will yell when something goes wrong, so they felt a bit exaggerated (see Figure 2).
Brittany: Overall, the program did a great job converting my thoughts into images. Although the emotions and facial expressions of some of the AI characters appeared over-exaggerated, I feel that this actually helped get the messages across, because many of my answers were emotion-based. My favorite set of images was the one generated for how I view the nursing profession (see Figure 7). My initial responses to this prompt had to do with patient advocacy and beneficence, and I like how the pictures always portray the nurse as a strong, yet still soft, ally for the patient.
Taylor: I do believe these images reflected my words. The images directly translated my words into actual images that told my story. I think some of the images could have done a better job in order to generate more accurate pictures. I really loved this. If you look at my first image in the “Why you want to be a nurse” section (see Figure 8), the AI art depicted an image of a nurse caring for a child. The image shows them holding hands, and a flower lies between them in their close connection. A nurse provides compassion and care to those in need, being their advocate in the healthcare setting. For vulnerable populations, children specifically, this is extremely true because they are not able to advocate for themselves. This AI image
specifically relays that level of compassion and care that a nurse should have. The image also depicts, in my opinion, the strength a nurse can give to their patients simply by being a good nurse. The flower, although I did not include this in my description of why I want to be a nurse, sparked a thought inside of me that a connection blooms between the nurse and the patient, or the building of rapport, which is even more important, in my opinion, to the skills that a nurse can provide. Nursing is about character, and this image really shows the character and qualities that a nurse should have.

**Figure 8**

*Taylor’s Images for “Why I Want to Be a Nurse”*
The second research question asked: What pedagogical and technological outcomes resulted from using generative AI as a teaching tool to reflect on the nursing profession? The four students answered the reflection question: “What did you learn from going through this process?” Here are the students’ responses in their own words.

Q4. What did you learn from going through this process?

*Hannah:* Many people are visual learners and AI can open so many doors for learning, understanding ethics, and visualizing your future as a nurse. It can help you see different perspectives and possibilities and allow your classmates and professors to understand your viewpoint to better support your journey as a student. Seeing these images felt like someone took a peek inside my head and painted my thoughts. I immediately wanted to take part in creating more images and brainstorming new ideas to use with AI.

*Tomek:* I learned about some of the biases that AI can have in nursing. I noted that all the nurses in the images followed a strict dress code with naturally colored hair, no tattoos, and professional haircuts. Some nurses wore outfits and hats that I associated with nurses working many decades ago. When I work in the hospital, I see many nurses with tattoos, piercings, and colored hair. Another bias I saw in my images is a lack of diversity and associating nursing as a female field. All the nurses in my AI images were Caucasian. Several men were in my AI images, but my professor revealed that she had to enter “male nurse” into the AI generator to get men into the images. I feel that AI has not caught up to the increase in diversity and men in nursing. Nursing has changed in that it is no longer a female-only field that does not allow nurses to express themselves.

*Brittany:* I really liked this process because graduation is coming up, so it really helped me reflect on why I’m doing what I’m doing. It made me think about the type of nurse that I want to be as well as behaviors that I will try to avoid. I liked the picture of the nurse walking side-by-side with her arm around an old woman using a walker the most (see Figure 7). The nurse is not physically supporting the patient at all, rather they appear to be walking as an allied front. Participating in this activity helped me reflect on myself as a person, and I think it is the first time I sat down and wrote down my honest reason for choosing the nursing profession. This activity also helped me reflect on the nursing profession as a whole and how AI can be used. The images generated for how I view the nursing profession mostly show nurses offering themselves and their time to patients. In reality, ev-
everything is so rushed, so the images really made me acknowledge the gap between how nursing should be compared to how it actually is.

Taylor: From participating in this activity, I learned that my thoughts and feelings can be transferred into images by AI that reflect my personal beliefs. Despite my previous beliefs about AI technology, this learning activity showed me that AI technology does contain the ability to incorporate an emotional aspect into the images that the technology generates. I also learned more about myself from this learning activity by diving deeper into my own beliefs about the nursing profession, and what a nurse is.

Qualitative Themes Identified

For RQ1, two common themes emerged from the qualitative analysis of the students’ reflection questions: (1) positive emotional responses to the images and (2) gaining knowledge and experience with AI. For RQ2, themes identified included: (1) self-reflection on students’ moral and professional identity development, (2) strange and inaccurate images, and (3) biases/stereotypes of nurses not based on contemporary realities. Table 1 provides an overview of the theme and sample quotes representative of the theme. These themes are explored in detail in the discussion section.

Table 1

Themes resulting from qualitative analyses of student reflections

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<tr>
<th>Research Question</th>
<th>Theme</th>
<th>Sample Quotes</th>
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| RQ1: What are the outcomes of using AI-generated art to increase students’ reflections and discussions on professional nursing topics? | Positive emotional responses to the images | “A lot of the pictures focused on humanity and the good of the nursing profession, so they made me feel hopeful that I can make a difference.”
“I was genuinely surprised at the internal feelings the images created for me.” |
| | Gaining knowledge and experience with AI | “I immediately wanted to take part in creating more images and brainstorm new ideas to use with AI.”
“This activity also helped me reflect on the nursing profession as a whole and how AI can be used.” |
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<tr>
<th>Research Question</th>
<th>Theme</th>
<th>Sample Quotes</th>
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| RQ2: What are the pedagogical and technological outcomes of using generative AI to reflect on the nursing profession? | Self-reflection on students’ moral and professional identity development | “It was good to reflect on some questions I have not been asked since starting nursing school.”
“Nursing is about character and this image really shows the character and qualities that a nurse should have.” |
| Strange and inaccurate images | | “My initial reaction to the images was that they were strange.”
“I think some of the images could have done a better job in order to generate more accurate pictures.” |
| Biases/stereotypes of nurses not based on contemporary realities | | “I feel that AI has not caught up to the increase in diversity and men in nursing.”
“Staffing and time constraints often prevent the type of nurse-patient relationships depicted in the images. It felt very idealistic rather than real world.” |

**DISCUSSION**

The first research question in this study explored the outcomes of using AI-generated art to increase students’ reflections and discussions on professional nursing topics. Students reported strong emotional responses like surprise and shock upon seeing their words translated into images. For example, Taylor stated, “I was pretty shocked at this realization and seeing my words translated into meaningful images actually brought up a certain level of emotion within me.” Another example is when Hannah stated, “I never thought of AI as something that could show emotion.” Some emotions were positive, particularly when students described feelings of inspiration and hope for their future careers as nurses. For example, Taylor stated that the images “were so inspirational and really touched me.”

These emotional responses to AI imaging are important for several reasons. First, emotional experiences are better remembered in education. Researchers have labeled this phenomenon *hot cognition*, or the idea that emotionally charged material is likely to increase long-term memory storage (Ormrod, 2020). Second, emotional engagement in education has been shown to be a predictor for academic success (Kuchinski-Donnelly &
Lastly, with the high levels of negative emotions such as stress, anxiety, (Liyanage et al., 2021) and dropping enrollment at nursing schools (AACN, 2023), creating educational experiences that are positive for students can serve as an important tactic for educators in recruitment and retention. Research should further investigate the role of arts-based learning (through continued AI-image generation) on the development of emotional intelligence which has been linked to decreased burnout (Daud et al., 2022). In this study, the lead researcher generated the images; future studies should explore the creation and re-creation of images (i.e., adapting prompts) by nursing students.

All four students noted that this activity increased their understanding of AI, which they had little knowledge or experience with beforehand. Brittany noted that after this experience, she wanted AI to “be regularly included in the nursing curriculum.” The students also noted that this was a positive learning experience; they desired more interactions with generative AI such as the ability to adjust their words and prompts to create even better images. This is consistent with calls in the literature to increase student’s training in AI by embedding AI courses and content into nursing curricula (Frith, 2019; Kwak et al., 2022; Taskiran, 2023). This is important considering the rapid rise in AI technologies and the ways in which AI is transforming multiple areas in healthcare such as administration, clinical care, policy, and research initiatives (Taskiran, 2023). Future research should explore efficient ways to engage and train nurses in conversations and practices around AI in healthcare (Ronquillo et al., 2021).

The second research question asked about the pedagogical and technological outcomes of using generative AI to reflect on the nursing profession. An important pedagogical theme identified in this study was that the AI generated images enabled students’ self-reflection on their moral and professional identity development. Taylor, for instance, suggested that the image she created “really show(ed) the character and qualities that a nurse should have.” Tomek added that it made him reflect “on what qualities (he) need(ed) to have and what qualities to avoid.” Brittany also noted in her reflection that it made her “think about the type of nurse that (she) want(ed) to be.”

Many of the AI-generated images in this study depicted empathetic nurse-patient encounters, highlighting the human connection and caring of nurses in an idealistic manner. Research has linked empathy and compassion in nurse-patient encounters to positive psychological and physiological benefits for patients (Trzeciak et al., 2017). Though there is lack of consensus in the literature on the exact definition of empathy, it is generally agreed that empathy is more than a static character trait; it is more fluid in nature,
and a skill which develops in response to one’s experiences (Levit-Jones & Cant, 2020). Using art experiences in education can impart empathetic as well as moral knowledge about what one ought and ought not to do, two concepts which are inherent to nursing and interconnected (Ugazio et al., 2014).

In addition to moral and empathy development, arts-based pedagogy has also been linked to increased self-reflection and professional identity formation (Andersen et al., 2022; Laranjeira et al., 2021). Using generative AI as a teaching method can create new spaces for reflective learning with faculty role models which has been reported as a key component in students’ professional identity formation (Vabo et al., 2022). Generative AI image-generation allows students who are not artistic naturally to still reap the benefit of arts-based learning in a time efficient manner and without special art supplies. Art, like nursing itself, can have a healing-action, often colliding with intangible realities in moral and spiritual realms. The experience of art is rewarding because it can be a source of knowledge about ourselves (self-reflection) and our relationships to each other and the world (Dewey, 1934; Young, 2001).

There are several technological outcomes that were identified in the students’ reflections regarding the images created by Midjourney. Although students suggested that many images were accurate in reflecting the students’ mental representations and words, others were noted to be faulty and inaccurate. Hannah noted the positive aspect of the technology stating that, “it felt like someone took a peek inside my head and painted my thoughts.” Yet Taylor noted that, “I think some of the images could have done a better job in order to generate more accurate pictures.” Tomek stated that his initial reaction was that some images were “strange.” Hannah also noted that some were “bizarre” and “seemed very futuristic” and had “objects that were unidentifiable.” In short, while some were contemporary, other images were either historical and outdated or futuristic and nonexistent in today’s nursing profession. One reason for this is that AI models may have been trained on a dataset of old photographs or artwork of nurses, which can influence the style of the generated images. It is important for users of Midjourney to have realistic expectations and anticipate that there will be times when the AI does not interpret the language of the prompts and performs poorly because it is still learning too (Lim et al., 2023). Creating prompts is an art in and of itself that often takes multiple reiterations as humans co-create an ideal image with AI (Kelly, 2022; Ninaus & Sailer, 2022).

Another technological theme was the biases and stereotypes of the nursing profession noted in the images. The gender bias noted in Midjourney when the word nurse was used as a prompt highlights the biases
and stereotypes of the nursing profession that persist in society and are reflected through AI (e.g., all female and mostly white nurses). The misperception that nursing is a female-only field can harm efforts of recruitment and retention of men in nursing (Gavine et al., 2020; Whitford et al., 2020). It is worth noting that Hannah’s images did contain men (see Figure 1) because the word nurse was not used in her writing on this prompt. The biases of AI run deep within the code and can exclude marginalized groups and promote inequalities if not recognized and dealt with (Levin, 2019; Srinivasan & Uchino, 2021). Future research needs to address these biases and other ethical issues, including best practices for nursing educators and students to responsibly manage AI-technologies.

Additional Implications for Practice and Future Research

With the current rise in society’s use of AI, educators must evaluate their teaching strategies to determine whether they are preparing students for the future or for the past. Due to potential ethical drawbacks with AI, faculty may be conflicted about whether to integrate AI into educational practices. Since AI can be faulty with its errors and biases, and it carries certain cautions for ethical use, students need to be equipped by faculty and taught how to evaluate for data biases (Huang et al., 2021)—not simply to ignore that AI exists. Research evidence provided in this study showed that using generative AI for image-creation allowed for nurses’ views of themselves and their profession to be explored in conjunction with public perceptions and cultural views of nursing. Therefore, AI should be integrated into nursing curricula for student nurses, so that future nurses are better prepared to participate in ethical applications of AI within the healthcare system (Frith, 2019). The positive news from this study is that students are ready and interested in AI, as noted by all students wanting more experience with AI at the completion of the study.

Future research using generative AI in nursing education should build on this work due to the obvious limitation of the small sample size. Future studies should also compare different types and levels of nursing students. For example, students in their freshman year could be compared with students in their senior year to examine how perceptions of nursing have changed throughout the nursing curriculum. Additionally, students who are not majoring in nursing could be compared with nursing majors to better understand cultural perceptions and barriers to entering the profession. Generative AI could be used in clinical experiences to promote reflection
on specific patient or staff encounters to promote increased reflection and emotional intelligence.

In this study, students were consumers of generative AI artistic creations, but future research should involve students as producers of AI content. Educators should collaboratively guide students in using AI through three stages: (1) learning about AI, (2) learning from AI, and (3) learning together with AI (Kim et al., 2022). Future research on generative AI as a teaching method could also explore quantitative research questions using valid and reliable tools for measuring knowledge, anxiety, or emotional intelligence. Finally, while this work was focused on AI-based image generation, future studies should also explore other AI tools for nursing.

CONCLUSION

This study is the first of its kind to pilot the intersection of AI-generated art, computer science, and learning, in nursing education. Using generative-AI as a teaching strategy with undergraduate nursing students promoted students’ self-reflections on professional identity and created powerful emotions to make meaningful connections. Nursing students need opportunities to increase their knowledge of AI while they are in training. Although some of the AI-created images were strange or had a past or futuristic feel, and others reflected the bias and stereotypes of the nursing profession within the culture. Many of them also displayed caring nurse-to-patient connections that were inspiring to students. Student participants agreed that using AI-generative art as a teaching method helped increase their reflections on the nursing profession and was an educational activity that instilled hope for their future careers as nurses.

REFERENCES


AI Image-Generation as a Teaching Strategy in Nursing Education


