Virtual Art Galleries as Learning Spaces and Agents of Praxis

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Abstract

Virtual art spaces offer a new medium through which the concept and form of art and learning spaces may be extended in the 21st century. With the growth of broadband internet and virtual reality technology, many museums have been acquiring the technology to create immersive virtual environments through which their art collections can be presented. In this article, the author describes unique, low-cost tools presented by gallery software programs that are transforming the way in which art may be presented and viewed. The author proposes that three-dimensional virtual galleries can link with the participatory action research methodology of photovoice, which stems from Freire's seminal work and serves to nurture *praxis*, or a pairing of reflection and action. This article fills the gaps in the literature regarding photovoice exhibitions and the contributions to teaching and learning using 3D virtual art platforms in educational contexts. Through study examples, the author asserts that virtual galleries may be utilized as a means to reach a broader audience and open new avenues to explore in the teaching of humanities. These virtual art spaces can foster critical dialogue, heighten social support, and empower learners through increased flexibility, choice, and perceptions of inclusion. The author concludes with an overview of the information needed to overcome the challenges of adopting such innovations.

Keywords: virtual gallery, virtual art exhibit, education, teaching, technology, photovoice, creative learning, inclusivity, innovation, *praxis*, Freire, social change

1. Introduction

Deep in the Yunnan province of China, rural farming women put down their hoes and picked up cameras. They had been asked by visiting researchers [1] to document their everyday life experiences to effect change. The participants' powerful black-and-white photographs ranged from a baby laying on the ground beside her mother who worked to weed the corn fields, a toddler left alone to feed his baby sister, and a "tiny, distant speck" [1, p. 180] of a woman in a vast field of rice she must cultivate.

Photovoice is an innovative qualitative research method that allows researchers to place cameras in the hands of often marginalized people to offer these participants a way to share their life experiences with a wider audience in the hope of effecting change. In this way, participants photographically document their everyday lives as an educational tool to showcase needed change, foster dialogue, urge action, and transform policy [1]. Although originally termed photo novella, which suggests picture stories, photovoice was developed from Wang and Burris' [1] research in the early 1990s as a way to document the life experiences of rural farming women in China to improve regional health and rural development policies. Through dialogue surrounding their images, 62 participants were empowered to share their varied upbringings, spousal relationships, and maternal roles [1]. Wang and Burris [1] noted:

> For these otherwise "undocumented" women to photograph their lives evokes a double power: It records for future generations what is happening now, and it enables the village women to define for themselves and others, including policymakers, what is worthy to remember and where change must occur (p. 185).

As such, photovoice became a powerful tool to create social change in Yunnan province as the participants' shared their concerns, hopes, and wishes to local policymakers [1].

Researchers use photovoice as a participatory research design method to document often unstudied populations' perspectives about a range of topics. Subjects have included mothers who manage learning differences [2], American Indian tribal communities' concerns about health and water [3], grandmothers who raise young children [4], doctoral students and their comprehensive examination experiences [5], and older adults' chronic pain practices [6]. Additionally, Forge and colleagues [7] used photovoice with homeless LGBTQ+ youth of color and explored participants' awareness of their positionality, a term used by Banks [8] to "describe the ways in which race, social class, gender, and other personal and cultural characteristics of knowers influence the knowledge they construct or produce" (p. 9). Three core themes emerged from this photovoice study: exploring participants' awareness of their positions and vulnerability in society; managing inner struggles, including conflicts with self-acceptance and religious decree; and building participants' feelings of resiliency and hope by means as significant relationships and life goals. The participants in Forge and colleagues' study noted that photovoice offered them a sense of hope and provided them with a means by which they can voice their goals for the future. Cordova *et al.* [9] employed photovoice to examine the role of eco-developmental factors, such as racism and socioeconomics, on alcohol and drug use among Latinos with physical disabilities with the aim of understanding participants' life experiences. Aparicio and colleagues' [10]

photovoice project granted young parents with foster care backgrounds the occasion to share their experiences during the COVID-19 pandemic. Finally, Shah [11] utilized photovoice as a participatory research method to enter the "black box" of rural girls' education in India. Ashby [12] defined this black box as organisms, devices, or situations for which inputs and outputs can be observed, but the connecting processes are not readily visible. Shah's case study used photovoice methodology to showcase the contents of the black box and hence to view the connection between education and girls' (dis)empowerment. Evidently, researchers have been able to use photovoice to study disparate, but often underserved, populations.

In the 21st century, three-dimensional (3D) virtual worlds have become burgeoning learning spaces [13]. In particular, virtual art spaces offer a new medium through which the concept and form of art may be extended [13]. Virtual reality uses computer simulation to present the user with a 3D virtual world [14]. In the last decade, with the growth of broadband internet and virtual reality technology, many museums have been acquiring the technology to create immersive virtual environments through which to present their art collections, and this growth is likely to continue in the future [15]. In this article, the author presents the unique tools presented by such gallery software programs as Kunstmatrix Technologies [16], ArtSteps [17], and CoSpaces [18]. High-quality 3D virtual galleries such as these have the ability to transform the way in which art may be presented and viewed. These innovations are "the introduction of something new" [19, p. 16], enabling individuals to create and showcase their art, thereby transforming the way art is "presented, organized, and sold online" [20].

Virtual galleries such as these can become tools to showcase the participatory action research (PAR) method of photovoice that involves collaboration between researcher(s) and participants centered around the lived experiences of the participants and four equally essential elements: participation, action, research, and social justice change [21]. Photovoice is adapted from Freire's [22] seminal work and uses dialogue to empower its participants [1] and "facilitate meaningful change via *praxis*" [21, p. 3], which is a pairing of reflection and action, or "informed action based on a balance of theory and practice" [21, p. 3]. Innovative virtual art programs in effect become tools to present and showcase artwork, such as is demonstrated below through the methodology of photovoice, in educational contexts; by doing so, these virtual art spaces offer users a broader audience through which to share their work while fostering critical dialogue, inclusivity, and empowerment.

2. *Virtual art spaces: a study*

Drawing on this premise that virtual art spaces are a way in which to engage and motivate students in educational contexts, Katz and Halpern [15] conducted a study titled "Can Virtual Museums Motivate Students?" that informed this author's [23]

subsequent research. Using a constructivist learning approach, Katz and Halpern [15] found that the more similar the match of the online museum experience is to its brick-and-mortar equivalent, the more affirmative the observer's perception of the art collection. The strengths and limitations of Katz and Halpern's [15] study, and with 3D virtual exhibitions in general, are presented in this section.

Katz and Halpern [15] conducted this study with 565 participants from a large northeastern U.S. university in order to test whether 2D or 3D virtual experiences would be a more powerful experience for the participants. The participants, who were offered this as part of an extra credit option by their instructors, were exposed randomly to four different exhibitions, including two-dimensional collections of art and aircraft museums and 3D collections of similar museums. Specifically, one-fourth of participants ($N = 142$) were asked to visit a 2D collection of the Museum of Fine Art at Houston; one-fourth ($N = 138$) were asked to visit a 2D collection of the Planes of Fame Air Museum; one-fourth ($N = 137$) were asked to visit a collection at the Art Institute of Chicago using the 3D tour platform presented by the museum; and the last fourth ($N = 148$) were asked to visit a 3D tour platform of the National Museum of the U.S. Air Force. In the 2D design, participants could expand the image and read specifications, but they could not interact with the place where the artifact was shown or observe them from alternative perspectives. In the 3D design, alternatively, participants could use arrow keys to steer exhibitions and zoom in or out to further explore them. Through this form of virtual interaction with the various 3D collections, participants were able to engage with the selected artifacts, such as a painting or airplane, as if they were visiting the brick-and-mortar museum. The 3D environment empowered the learner more, providing more flexibility and choice and "creat[ing] a sensation of immersion by involving the user with action on the screen" (p. 780). The participants were sent a questionnaire with the websites for the 2D and 3D places of interest and two questions to determine if the participants truly engaged with the material. Participants were also asked to complete Likert scale questions that measured their attitudes toward museums, sense of telepresence, involvement, interest in art, interest in new technologies, frequency of museum visits in the last three years, and their internet use and interaction in virtual environments.

To determine the predicted mediating effects of involvement on attitudes toward virtual museums, Katz and Halpern [15] employed hierarchical multivariate ordinary least squares regression to compare participants' attitudes who attended the 3D virtual museums tour with the attitudes of participants who viewed the 2D online version. The researchers complemented this with a bootstrap test, a statistical technique that resamples a dataset to determine if a correlation is significant and to correct sampling bias. Katz and Halpern discovered that the participants who

experienced 3D tours had a higher sense of telepresence, or "sensation of being immersed in the remote environment" [15, p. 778]. Their participants interacted with the exhibitions, had more positive attitudes toward and stronger intentions of visiting the museum, and displayed an overall higher involvement level than participants viewing the 2D collections. The authors argued that the 3D virtual experiences more closely mirrored the brick-and-mortar museums, which led the participants to feel more involved and more apt to visit the real museum(s). This research can be applied to educational contexts, the researchers noted, as they proposed that active learning environments enhance students' motivation and reasoning process and can more effectively engage students cognitively, thereby intensifying their learning.

The success of 3D virtual technology was overwhelming in Katz and Halpern's [15] research study. The authors provided empirical evidence to showcase how participants engaged more cognitively with 3D virtual museum exhibitions. Their findings that 3D virtual technology was able to engage participants cognitively suggest the significance of 3D virtual design and imply that this innovation may be extended not only to museums but to educational contexts and other research studies.

3. Gallery software programs

Gallery software programs, such as Kunstmatrix Technologies, ArtSteps, and CoSpaces, offer a distinctive medium through which the concept and form of art and learning spaces may be extended in the 21st century. The following subsections present three gallery software programs that offer the necessary tools to set up virtual exhibitions.

3.1. Kunstmatrix Technologies

Kunstmatrix is a Berlin-based startup that began in 2007 by Christoph Lauterbach and Hartwig Bentele, who had backgrounds in computer programming, architecture, entrepreneurship, and 3D modeling. The following year, Dr. Kristian Hildebrand joined Lauterbach and Bentele and was able to offer a scientific background as well as networking and programming skills. Kunstmatrix was the first company to provide self-curated exhibitions in 2009, a reality app in 2012, a virtual art fair in 2014, and the prototype of art virtual reality [20]. With slow growth in the European art market, in 2017 Kunstmatrix's focus landed on the international market, including the United States, and the artists and small galleries found within; as such, the company grew and expanded its business and size as the leading provider of virtual exhibitions today [20].

Additionally, when the COVID-19 pandemic hit in 2020, the opportunities for safely sharing art digitally rather in person with crowds at museums seemed even

more necessary. In this way, Kunstmatrix is now the leading provider of virtual exhibitions [20]. With the goal of "providing ever better solutions in the art market" Kunstmatrix's capable and versatile software offers solutions to artists, galleries, museums, auction houses, and art fairs [20].

There are options to choose the gallery layout (figures 1–3), wall colors, size of the art presentation, frames, text, and music. In this web-based application, artists use room templates to share their exhibitions privately or publicly directly on Kunstmatrix's website or even embed their exhibition into a personal website [20, 24].
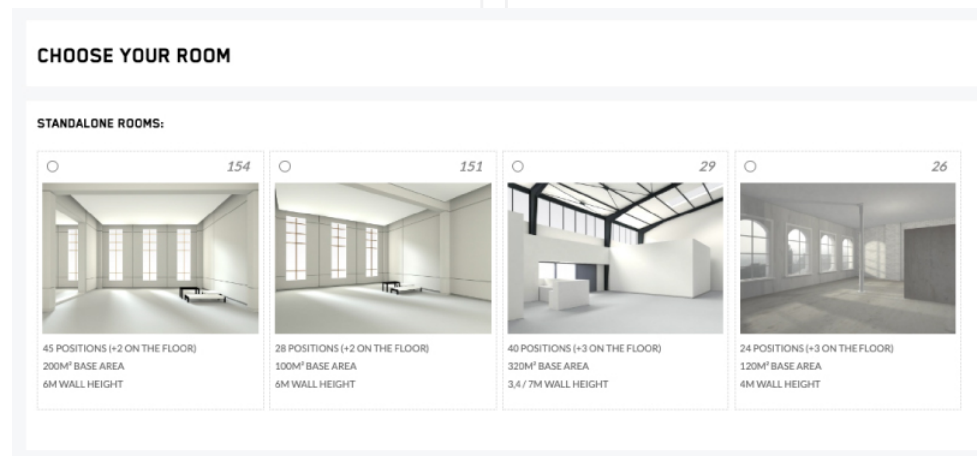

Figure 1. Kunstmatrix users can select from multiple options of 3D virtual art gallery rooms depending on their desired gallery size and design.
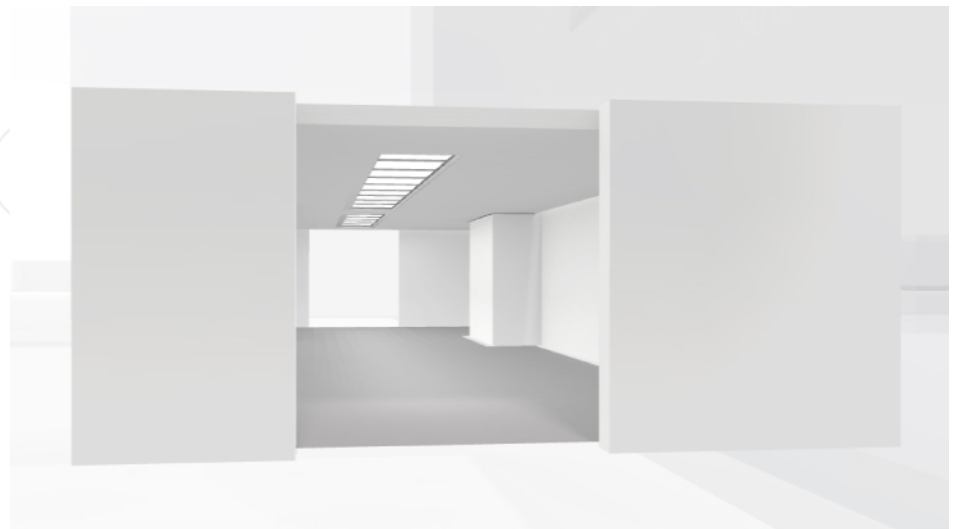

Figure 2. Example of unfinished 3D virtual art gallery room presented by Kunstmatrix.
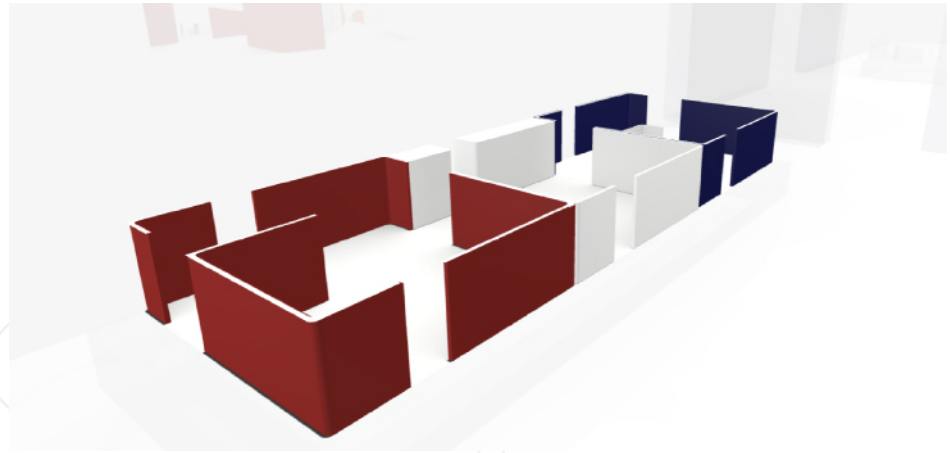
Figure 3. Example of how a Kunstmatrix user can choose the gallery layout by connecting gallery rooms to one another for larger installations.

This space offers free and low-cost options for artists to share high-quality 3D virtual exhibitions of their art, whether photography, paintings, or sculptures (figures 4–8).
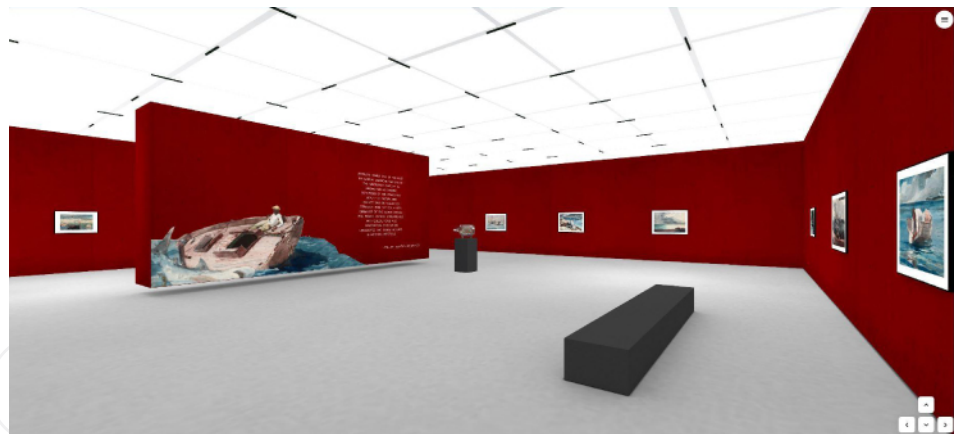
Figure 4. Winslow Homer at the Art Institute Chicago, an example exhibit published on Kunstmatrix.

It is evident that Kunstmatrix Technologies has become a world leader in digital art tools that transform the way in which art can be shared [20]. With over 6000 international exhibitions and millions of visitors to their website, this digital innovation has transformed the way art is "presented, organized, and sold online" [20].

Figure 5. Snowflakes at Smithsonian, an example exhibit made with Kunstmatrix.

Figure 6. Sculpture exhibit with 3D models presented by Kunstmatrix.

Figure 7. Alternative view of sculpture exhibit with 3D models made with Kunstmatrix.

Figure 8. Close-up of 3D "Egyptian cat bronze" sculpture with accompanying information that Kunstmatrix users may select under "detail view," including size, material(s), and description.

In a recent research study, Hadavi *et al.* [25] employed Kunstmatrix Technologies to determine if virtual galleries with both visual and auditory stimuli could increase positive affect during the heightened time of anxiety and depression that many felt during the COVID-19 pandemic. These researchers found that by viewing 56 works of art hung in eight 3D virtual rooms, the 160 participants confirmed a heightened positive affect and decreased negative affect; of note, however, was that the addition of music did not appear to influence these positive results. Hadavi and colleagues [25] concluded that the virtual exhibit presented through Kustmatrix improved participants' overall moods during the pandemic.

3.2. ArtSteps

This subsection provides the results of a research study that utilized ArtSteps, a second gallery software program that extends the tools needed to create virtual exhibitions. Cruz and Torres [26] presented their study using ArtSteps as their selected virtual exhibit tool. Engaging 35 educators in a range of subject areas, the researchers questioned whether virtual learning environments could support educator engagement and receptivity to using these environments with their students. Interestingly, before this study, 56% of the participants "did not know and had never heard of" (p. 167) virtual learning environments, and of those who had, 82% had still never used such a program in their classes. However, 100% of these teacher participants were "receptive to using ArtSteps" (p. 167), and all teachers noted in their final reflections that virtual learning environments can motivate students to learn in educational contexts. Cruz and Torres' [26] findings indicated that teachers are "receptive" to using virtual learning environments such as ArtSteps with their students. This study heightened educators' awareness of such platforms and inspired them to use these types of tools in their classrooms so as to support

varied curriculum content. Cruz and Torres [26] concluded that "technology is an ally of pedagogy through the use of devices that most teachers have at their disposal" (p. 168).

3.3. CoSpaces

This subsection provides a summary of a research study that employed CoSpaces, a third option of a virtual reality gallery software program that also offers tools to set up virtual exhibitions. Wu and Hung [27] conducted a mixed-methods study using CoSpaces to ascertain 6th-grade students' English-speaking performance at a school in central Taiwan; 28 out of the 56 students were selected to participate in the experimental group guided with CoSpaces, whereas the remaining participants were guided solely with stationary pictorial images. The researchers found that there was a significant improvement in students' grammar and lexical speaking performance but not in their pronunciation, fluency and intonation, willingness to communicate, or learning autonomy. Wu and Hung [27] emphasized that the student participants "felt positive" (p. 1580) after using CoSpaces in their English class, stating they enjoyed the "visualization," "vividness," and "brand new learning experience" (p. 1580). Additionally, the students believed the use of virtual reality improved their English speaking, reading, and vocabulary. One noteworthy suggestion Wu and Hung [27] offered to teachers who desired to incorporate virtual reality into their lessons was to consider adding interactive features, such as conversations with avatars or assessment games inside of the software program.

4. Photovoice

In this section, the author first outlines photovoice, including its goals and a brief synopsis of literature that presents empirical research on photovoice exhibitions. Currently, there is a dearth of empirical research concerning photovoice images displayed in virtual 3D art galleries; as such, the author [23] also shares the results of her own virtual photovoice exhibit, part of her doctoral dissertation, as one way in which virtual spaces may be utilized to showcase art. At the time of this study, the author had not found any other study that included photovoice as a 3D virtual exhibit. For these reasons, combined with practical constraints such as the COVID-19 pandemic and Institutional Review Board's protections for human research subjects, the author selected photovoice as the chosen methodology for her study in the hope of increasing inclusivity within school communities for LGBTQ+ individuals at the micro-level while also promoting critical dialogue.

First, the author conducted a literature review of peer-reviewed empirical research studies and books regarding possible means to increase perceptions of inclusion for LGBTQ+ populations within schools. The concept of silencing revolves around power relations, and dialogue is fundamental to the framework of

education [28]. After consideration of practical constraints, the researcher categorized potential interventions through the lens of Freirean critical dialogue [22] as an agent for transformative critical thinking in education. The author selected photovoice, a PAR strategy rooted in Freire's [22] approach to education, as a qualitative research method through which LGBTQ+ inclusion could be fostered in educational systems and beyond.

The three main goals of photovoice, which all serve to nurture *praxis*, include: (a) documenting and reflecting on the participants' community's strengths and limitations, (b) fostering critical dialogue through group discussion of the photographic images, and (c) reaching influential audiences such as policymakers [26]. Through photovoice, participants photographically document their life experiences as an educational tool to showcase needed change, foster dialogue, provoke action, and transform policy [1]. Freire [22] postulated that photographs promote critical reflections about lived experiences, and through a collective discussion of these images, dialogues can expose socially constructed beliefs that preserve marginalization [21]. Photovoice also presents a concrete way through which a researcher, educator, or others can delve into the meaning of people's lived experiences: "how they perceive it, describe it, feel about it, judge it, remember it, make sense of it, and talk about it with others" [29, p. 104]. Additionally, photovoice experiences offer participants an opportunity to listen and learn from one another, enhance rapport and trust, and raise social support [30, 31].

Photovoice reflects the documentary photography genre in which the visual image permanently encapsulates a moment in time to tell its story, be it one of violence, seclusion, or destitution; however, photovoice removes voyeurism. Participants who employ photovoice feel a sense of empowerment as they take photographs with their own hands and tell their stories in their own voices [1]. Wang and Burris [1] noted that Dorothea Lange's [32] iconic "Migrant Mother" photograph, for example, became the world's most reproduced photograph; it may have helped other migrant workers, but the subject participant, Florence Thompson, received neither payment nor even a copy of the photograph.

As a research method and possible intervention, photovoice characteristically includes several steps: creating a focus group, finalizing a theme of the project, taking individual photographs, selecting images from the collection (either individually or as a focus group), contextualizing the chosen photographs through either dialogue or written text (or both), codifying the themes linking the photographs, and targeting an audience beyond the focus group [2].

The four photovoice participants who volunteered to participate in this author's exploratory multimethod photovoice study were identified as LGBTQ+ educators. They had teaching experience that ranged from 10 to 43 years, two males and two females. Two participants were White, one Black, and one multiracial. During the 19-min orientation video that the author recorded through Loom [33], she highlighted the following themes as suggestions for participants to consider when taking their photovoice photographs, while also explaining that the participants could choose whichever themes they would like to showcase their lived experiences: (a) family, (b) home, (c) peers, colleagues, and friends, (d) school, (e) neighborhood, and (f) community. Pre- and post-focus group interviews were held via Zoom [34] and recorded through Otter.ai [35] for later transcription. The author held the focus group over Zoom for the four participants to engage in critical dialogue by sharing and discussing their photovoice photographs, which was also recorded through Otter.ai for later transcription. When asking participants to contextualize their chosen photographs during the focus group, the author utilized the PHOTO technique [36], which is further outlined in the following section (figure 11).

After the focus group, the author created a 3D virtual photovoice exhibit held for three months on Kunstmatrix (figure 9). To generate viewers, the author disseminated information about the photovoice exhibit through virtual flyers, emails, phone calls, word of mouth, texts, and social media such as Facebook [37]. Exhibit viewers were asked to complete an optional online survey, which offered both quantitative and qualitative data on their perspectives of the photovoice exhibit as well as their perceptions of the experiences and challenges for LGBTQ+ individuals and how they might improve school climates for these individuals.

Figure 9. The author's photovoice exhibit in a 3D virtual art gallery presented through Kunstmatrix.

At the end of three months, the exhibit concluded, and 102 exhibit viewers were chosen to complete the author's survey, which was embedded in a QR code [38] on a virtual laptop found in the center of the art gallery (figure 10), as well as offered as a website link before entering the exhibit.

Figure 10. Close-up of author's survey access QR code for photovoice exhibit viewers.

The author then coded the transcribed qualitative data using first in-vivo coding, taking words directly from the participants' voices [39]. Then, the author utilized pattern coding, a form of coding used to group similar codes together based on shared commonalities to generate key themes [39, 40] as well as descriptive statistics to analyze the quantitative data. The results of both data sets are highlighted in the concluding section.

The author drew several conclusions from the data sets within this intervention study. Four primary themes emerged from the qualitative data with the four photovoice participants: (a) resiliency in the face of adversity, (b) the role of self-identity and its development, (c) empowerment as a means of change, and (d) evolution of public perception.

Additionally, quantitative feedback from the exhibit survey showed that 95.1% of the photovoice survey respondents agreed or agreed somewhat that the exhibit was interesting while 90.2% of the photovoice survey respondents agreed or agreed somewhat that the exhibit was relevant and meaningful. Most survey respondents (96%) reported having felt emotions or feelings while viewing the photovoice exhibit, and 75.5% of the photovoice viewers agreed or agreed somewhat that the exhibit helped them to better understand the experiences and challenges for LGBTQ+ individuals.

Overall, this unique methodology offers its participants an opportunity to learn about one another, demonstrate imagination, build self-esteem, enhance rapport and trust, and heighten social support [30, 31]. In the following section, the framework of Freirean critical dialogue [22] is presented as a way to foster critical dialogue, and the author will outline how virtual art galleries such as this one can become agents of *praxis*.

5. Agents of Praxis: critical dialogue as a communication process

Educational researcher Joan Wink [28] anchors dialogue as the framework of education. Isaacs [41] expands on dialogue as a:

> discipline of collective thinking and inquiry, a process for transforming the quality of conversation and, in particular, the thinking that lies beneath it … a sustained collective inquiry into the processes, assumptions, and certainties that compose everyday experience (pp. 24–25).

In essence, dialogue allows an individual to confront his or her assumptions, showcase feelings, and strive to build common ground together [42]. It offers an environment in which individuals are able to participate consciously to create shared meaning [41] and understanding [42]. Dialogue is essential as a means through which culture can be understood, and learning ultimately depends upon this cultural understanding. As such, dialogue is not merely a simple exchange of words: it is a process that, through the exchange of voices and interactions, generates and alters social worlds, thereby creating the opportunity for transformation [43].

Specifically, critical dialogue can be understood as a communication process that offers the ability to consider, hold, and compare multiple complex viewpoints. More specifically, it is "discursive work or *praxis* that involves constructing, deconstructing, and reconstructing knowledge of status quo discourses" [44, p. 199]. Rather than focusing on solving conflicts between two or more cultural groups with a history of conflict, critical dialogue instead focuses on participants of differing and shared social identities to examine power, privilege, and oppression to promote equity and social justice. Thus, the critical form of dialogue focuses on a multiplicity of viewpoints [45] that can be potentially transformative on individual and societal levels [44]. In this way, dialogue transforms into "change-agent chatter" [28, p. 65] as uncritical assumptions are examined in and out of the classroom [46]. Although dialogue may be "imperfect and unfinished" [44, p. 198] due to its dependence on

human interactions, it can nonetheless create an environment in which important social justice principles, such as power and fairmindedness, can be explored in educational contexts [47].

In Chapter 3 of his seminal text *Pedagogy of the Oppressed*, Brazilian educator and philosopher Freire [22] examined the use of critical dialogue as an agent for transformative critical thinking in education. Freire, a leading scholar of critical pedagogy, defined critical thinking as the following:

> Thinking which discerns an indivisible solidarity between the world and the people and admits of no dichotomy between them—thinking which perceives reality as process, as transformation, rather than as a static entity—thinking which does not separate itself from action, but constantly immerses itself in temporality without fear of the risks involved [22, p. 65].

Freire highlighted the importance of dialogue within a group as a generator of critical thinking: "Only dialogue, which requires critical thinking, is also capable of generating critical thinking. Without dialogue there is no communication, and without communication, there can be no true education" [22, pp. 65–66]. By actively discussing inner thoughts and implicit and explicit views of the word, an individual can take command of his or her thinking and become truly educated. Freire elaborated that dialogue not only requires critical thinking, but also love, humility, active hope, and a strong—yet not naïve—faith in humankind to exist. Freire used the content of images, such as photographs, to foster this form of transformative dialogue because he believed these images "function as a mirror to communities" [21, p. 3] by reflecting the sociocultural realities that influence people's daily lives [21]. Photographs, he argued, could be used to achieve his goal to "facilitate a new awareness of self-in-context that could inform social change" [21, p. 3].

From this new awareness, a climate of mutual trust between or among the participants can be established as they are able to name the world around them and thereby effect social change. As dialogue is used to name, it cannot occur with those who have been silenced and denied their "primordial right to speak their word" [22, p. 61]. Freire emphasized that it is imperative to engage in true dialogue, rather than a depositing of ideas from one person to the other. It is via this form of dialogue that transformation can result because "to speak a true word is to transform the world" (p. 60). True, authentic word is a *praxis*—a pairing of reflection and action—to bring about transformation. Those who are silenced must reclaim their voices to halt the furtherance of this debasement and, instead, nurture Freire's theory of *praxis*. It is only through critical dialogue, Freire asserted, that individuals can "achieve significance as human beings" [22, p. 61].

Photovoice's theoretical foundation stems from Freire's approach to education in his critical consciousness theory, which emphasizes the need to become critically aware of one's assumptions and actions that can contribute to oppressive social structures and systems, as well as from feminist theory, which highlights the value of women's experiences [1, 21, 22, 48]. Wang and Burris [1] posited that in Freire's [22] terms, photography reflects the community by mirroring everyday social and political realities that serve to shape lives in small and large ways. Freire [22] postulated that photographs represent sociocultural signifiers, such as values and expectations, that promote critical reflections about lived experiences [21]. Through a collective discussion of these images within a group, participants can attain critical consciousness and, only then, meaningfully engage in *praxis* [21].

In the author's photovoice study, she held one focus group for all participants to share and discuss their selected photovoice photographs over Zoom. As per the PAR method, participants selected their photovoice photographs and provided accompanying narration, both of which became a part of the virtual photography exhibit. Participants were asked to narrow down their top six to 10 new or previously taken photographs to share in the focus group, identify themes, and document their stories through a facilitated discussion about the photographs and ways to take action about the issues and themes their photographs portray [49]. The author then asked the participants to email her their chosen photographs to share with the group, which she placed in a PowerPoint file [50] she created that contained all participants' photographs. This PowerPoint was screenshared through Zoom during the focus group so that all participants could clearly see the photographs and engage in the resulting critical dialogue.

When asking participants to contextualize their chosen photographs, some photovoice researchers chose to use researcher-developed questions, but most researchers employed the "SHOWeD" technique (figure 11)—which stands for "What do you **s**ee here? What is really **h**appening here? How does this relate to **o**ur lives? **W**hy does this problem, concern, or strength **e**xist? What can we **d**o about it?" [30, p. 84]—to focus and engage participants in critical dialogue. Of note, some researchers cited that the SHOWeD technique was unsuccessful in their focus groups [51, 52]. Therefore, the acronym "PHOTO" may find more success with participants. PHOTO stands for (figure 11):

> Describe your **p**icture. What is **h**appening in your picture? Why did you take a picture **o**f this? What does this picture **t**ell us about your life? How can this picture provide **o**pportunities for us to improve life [with regard to the theme of the photographs]? [36, p. 134].

Photovoice: Guiding Questions

SHOWeD Technique

- What do you **s**ee here?
- What is really **h**appening here?
- How does this relate to **o**ur lives?
- **W**hy does this problem, concern, or strength **e**xist?
- What can we **d**o about it?

Wang et al., 2000, p. 84

PHOTO Technique

- Describe your **p**icture.
- What is **h**appening in your picture?
- Why did you take a picture **o**f this?
- What does this picture **t**ell us about your life?
- How can this picture provide **o**pportunities for us to improve life [with regard to the theme of the photographs]?
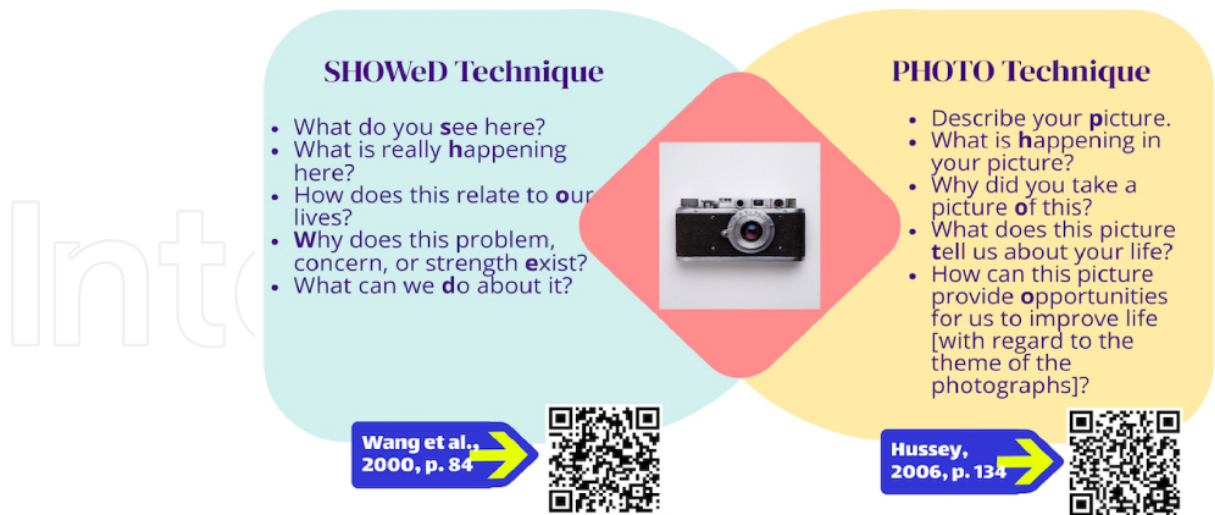
Hussey, 2006, p. 134

Figure 11. SHOWeD and PHOTO techniques for photovoice.

For her focus group, the author chose to use the guided PHOTO approach [36] as an alternative to the SHOWeD approach [30]. After engaging with the focus group and hearing the results of the post-focus group interview, the author concluded that the four LGBTQ+ educators who participated in this research study engaged in increased critical dialogue, a goal of photovoice [30]. The dialogue contained multiple perspectives in an accepting climate heightened photovoice participants' perceived sense of inclusion, and this engagement was supported by the qualitative data the author obtained, analyzed, and triangulated. Therefore, the proximal benefits for LGBTQ+ faculty and staff who participated in the intervention included increased perceptions of critical dialogue as well as allowances for multiple perspectives and senses of inclusion and representation.

If participants are unable or unwilling to meet in person or via synchronous video conferencing, such as through Zoom, there are other avenues for photovoice participants and viewers to engage in critical dialogue. For example, in a virtual environment, options may include virtual boards such as Padlet [53] or video discussion platforms such as Flipgrid [54], which allow users to correspond with one another asynchronously either through written and/or verbal correspondence (figure 12).

Additionally, QR [38] codes might be placed beside each photograph to provide viewers with a change dialogue about the images and narratives in the virtual exhibit.

To summarize, photovoice empowers participants to become self-advocates and catalyze personal and local change [1, 55, 56]. Using the PAR methodology of

Figure 12. Asynchronous virtual options to engage in critical dialogue.

photovoice, educators can work to foster Freirean critical dialogue [22], increased shared meaning and common ground, and increased representation within educational contexts such as classrooms and schools. Virtual galleries can become tools to showcase photovoice, which stems from Freire's [22] seminal work and serves to nurture *praxis*. By doing so, virtual art galleries, such as the ones presented in the studies cited in this article, may be utilized as tools to present and showcase artwork as learning spaces and agents of *praxis*. These spaces offer students a broader audience, foster critical dialogue, heighten social support, and empower learners through increased flexibility, choice, and perceptions of inclusion.

6. *Other benefits to virtual art spaces*

As a new medium through which the concept and form of art and learning spaces may be extended, the benefits of utilizing virtual art spaces for educational advancement are numerous. Rather than more traditional brick-and-mortar photography galleries, virtual art spaces have the potential to reach far more viewers, are more cost-effective, and create less environmental waste. For example, there is a possibility of reaching over one thousand unique visitors each month if featured on Kunstmatrix's main page, and the virtual gallery may be viewable on search engines and through Google AdWords [16]. Often, exhibitors would not be able to access this number of visitors any other way, and the international reach that virtual art spaces offer is unique. Furthermore, when compared to the high cost of printing large photographs and displaying them in a brick-and-mortar photography

exhibition, virtual galleries such as Kunstmatrix, ArtSteps, and CoSpaces are more affordable, ranging from no cost to approximately $70 per month. Brick-and-mortar options are also more constrained due to space limitations (the aforementioned "Migrant Mother" photography [32], housed by the Museum of Modern Art (MoMA) in New York City, is currently described as "not on view" at the brick-and-mortar museum, although one can effortlessly view this image as well as over 300 of Lange's other photographs on MoMA's website). Last, there are no paper products, flyers, or photography chemicals used if it is all virtual, which ultimately creates less environmental waste. With these myriad benefits, however, there are also barriers to the adoption of this type of virtual technology, which is explored in the following section.

7. Barriers to adoption

Three-dimensional virtual reality technology is expanding and is likely to grow in the future [15]. This technology tool is double-edged [15] and, therefore, barriers to its adoption must be considered. First, users of 3D interactive technology must have access to computers with high-speed internet connections; they must also be technically savvy enough to be able to install browsers, update software, and register to join websites [13]. Additionally, navigating 3D technology is more difficult than that of 2D [15]. Katz and Halpern [15] also found that participants who had more experience using the internet and virtual environments prior to the study were more involved than participants with less experience within these areas, which presents another barrier to adoption. Additionally, the researchers noted that it appeared the wealthiest museums were able to provide these 3D experiences, whereas smaller and less prosperous museums could only offer the 2D virtual experience; interestingly, this can create a new bias [15]. Rogers [57] identified complexity and compatibility as attributes of innovation perceived by members of a system that determine whether an innovation will be adopted. As noted, this interactive 3D technology requires users to have access to computers with high-speed internet connections and to be technically savvy enough to be able to install browsers, update software, and register to join websites [13]. Finally, navigating 3D technology is more difficult than that of 2D [15]. As such, these are barriers to adoption because without technological savvy and the proper instruments, the innovation will be perceived as more difficult to learn and implement and, therefore, less likely to be adopted [19].

8. Conclusion

Virtual technology websites offer cognitive engagement [15] while being practical, cost-effective, and available anytime, anyplace, 365 days a year [58]. Indeed, this innovation is "one of the best ways of disseminating digital information" [58, p. 83]

and offers "total audience immersion [so as to] leave the [viewer] fully engaged in the context" [13].

Photovoice and other projects that involve photography and other media, whether viewed or created by students or educators, have the capacity to offer Freire's [22] call for *praxis*. As concepts such as power, ideological beliefs, equity, and social justice take center stage in education, there is the possibility for transformative growth. Photovoice, therefore, promotes Freirean critical dialogue [22] across students, educators, families, and schools. In addition to the narrative text, both visuals and voices seem essential to breaking silencing, and students leave the classroom feeling seen (through the photographic images), heard (through shared critical dialogue), and empowered.

By using 3D virtual art spaces, the concept and form of art and learning spaces can merge to form "culturally inclusive partnerships and communities" [59, p. 18] that encompass and embrace all voices.

Conflicts of interest

The author declares no conflicts of interest regarding this article.

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