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Creating Project-Based Learning for Online Art Classrooms

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Abstract. Project-based learning (PBL) is considered an engaging and promising pedagogy across diverse disciplines and student populations in the United States in the digital age. Research on PBL in online environments and in the field of art has, however, been limited. Thus, the purpose of the current study was to examine the theoretical grounds of PBL and analyze its pedagogical features and application. Of specific interest is Krajcik and Shin's (2014) PBL model, which includes six pedagogical features: asking driving questions, emphasizing learning goals, fostering authentic practice, enhancing collaboration, learning with technology, and creating artifacts. An account of a qualitative descriptive pilot study conducted in an undergraduate online art course further explicates the application of this PBL model. The pilot study accentuates ways to create an online PBL art classroom and illustrates students performing PBL through their arts-based research projects. Reflection on pedagogical recommendations and the challenges of implementing PBL in the online art classroom concludes the study.

Keywords: project-based learning, online art class, arts-based research

Recent national surveys have corroborated the exponential growth of fully or blended online courses in U.S. higher education (Ginder et al., 2018; Seaman et al. 2018). College and university faculty are increasingly expected to teach courses in online environments. This development has motivated researchers and educators in online education to conduct theoretical and experiential inquiries to identify, implement, and evaluate online pedagogies (Alexander et al., 2019; Anderson, 2008). These researchers' underlying aspirations have been to create a robust and engaging online learning environment supporting 21st-century students' learning preferences and cognitive development.

Marc Prensky (2001), best known for popularizing the terms "digital native" and "digital immigrant," argued that digital native students' learning preferences and knowledge construction processes differ from those of their digital immigrant professors. Small and Vorgan's (2008) cognitive neuroscience and neuroimaging-based research further provided insights into digital natives' mental functioning. The researchers speculated that daily absorption of and interaction with the new technologies from social media, virtual interactive entertainment, and the internet have stimulated neural circuitry in human brains resulting in certain kinds of social and intellectual abilities and patterns. By studying and comparing neural circuitry between the digital natives and digital immigrants and the effect of social media on digital natives' neural pathways in the brain and cognitive processes, they discovered that digital natives simultaneously acquire and (re)construct knowledge socially, cognitively, and technologically.

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Educators understand that technology plays an essential role in facilitating 21st-century students' learning, yet Prensky (2010) observed a mindset in which concerned educators tend to worry about their ability to catch up with new technologies and to believe they need additional training in how to use new technologies for meaningful teaching. He offered some advice, proposing that the challenge facing 21st-century teachers is to worry less about the details of new technology and instead become comfortable with a different and better kind of pedagogy that enables students to build educational partnerships with or through technology and to use technology to actively enhance their own learning. According to Prensky, professors—especially those who teach nontechnology-related subjects—do not need to become technology "experts" in order to teach effectively. Instead, they should endeavor to identify and implement a pedagogy that promotes students to partner with technology to accomplish pedagogical objectives.

In recognition of Prensky's (2001, 2010) and Small and Vorgan's (2008) assertions, the purpose of the current study was to introduce a pedagogy that corresponds to 21st-century digital learners' cognitions, technological conditions, and ways of knowing while addressing a significant research gap in college online art education. This pedagogy, called project-based learning (PBL), is appreciated as a progressive educational model and a promising pedagogy in the digital age (Condliffe et al., 2017). Although numerous PBL researchers have considered technology indispensable in creating a PBL environment, research on PBL in online classrooms and at the postsecondary level is limited; moreover, in the field of art, research focusing on online teaching and pedagogy has been sparse. Thus, conducting additional case studies on the implementation of PBL in online classrooms is necessary to assist professors in the arts, art history, and art education in designing robust online curriculum. Consequently, the aim of this article was to present a theoretical synopsis and a pilot case study of PBL, emphasizing the following topics: (a) the theoretical foundations and six pedagogical features of PBL, (b) the application of PBL in an online art appreciation course illustrated by the student projects, and (c) lessons learned from the current study.

Theoretical Grounds of Project-Based Learning

PBL has been continuously theorized, applied, and revised by a number of researchers and institutions across diverse disciplines and student populations (Boss & Krauss, 2014; Boss & Larmer, 2018; Condliffe et al., 2017; Dierker et al., 2012; Hunter-Doniger, 2018; Krajcik et al., 1998; Krajcik & Shin, 2014; Larmer et al., 2015; Laur, 2013; Shiraz & Larsari, 2014; Vaz et al., 2013). This has resulted in various versions of PBL, each presenting certain features corresponding to the needs of the discipline and the cognitive level of student population. Nevertheless, according to PBL researchers and practitioners (e.g., Hunter-Doniger, 2018; Krajcik & Shin, 2014), PBL can be generally defined as a pedagogical praxis promoting a student-centered, inquiry-based, and systematic approach to learning, where students actively engage in the construction of their own knowledge by devoting considerable time to devising projects to probe and propose solutions to real-world problems relevant to students' lives. The foundation of PBL derives from four learning sciences ideas: (a) active construction, (b) situated learning, (c) social

interaction, and (d) cognitive tools (Krajcik & Shin, 2014). As elucidated below, these ideas are embedded in the models of learning and developmental science theorized by John Dewey, Jean Piaget, and Lev Vygotsky.

Dewey (1938, 2001) aligned his educational theories with a philosophy of pragmatism and a profound belief in democracy. The investigating and proposing solutions to real-world problems, situated learning, and student-centered projects emphasized in PBL reflect Dewey's educational theories. Dewey argued that curriculum and classroom activities should be relevant to learners' lives and lead to the development of practical skills and knowledge that one can use in real life. Proposing an educational process of learning by doing, Dewey believed that meaningful learning requires learners to take an active role and immerse themselves in the process of their own learning. He advocated classroom democracy, in which teachers assume the role of facilitator and guide to help create both a learning environment and process that enable students to achieve contextualized, experiential, real-world, and active learning. In Dewey's view, learning involved experiential, social, and interactive processes through which knowledge does not merely passively transmit from teacher or book to students but is actively and collaboratively constructed by students.

In Piaget's (1968) theory of cognitive development, experience-based learning and the learner's interaction with the external environment are recognized as significant components in a child's acquisition of knowledge. This theory contributes to the real-world-based learning and the use of cognitive tools in the knowledge-construction process as embraced by practitioners of PBL. A child's cognitive development occurs through continuous internal mental coordination as a result of biological adaptation and maturation as well as external interaction with the environment (Gallagher & Reid, 1981/2002). To Piaget, knowledge was not simply a piece of information to be delivered and received; knowledge is acquired through experience and a set of structures progressively constructed by interaction between the learner and the external environment. This constructivist approach suggests the learner's active building up of knowledge and cognitive process. Growth in knowledge can, moreover, be stimulated by a human- or technology-generated feedback process followed by questions, contradictions, and consequent mental adaptation and reorganization of existing units of knowledge into new and more complex intellectual structures (Cockcroft, 2009).

Vygotsky's (1978) theory of social constructivism, probing the social aspect of the learning process, provides a framework to appreciate the social interaction and collaboration—hallmarks of PBL—in the learner's active knowledge construction process. Vygotsky believed that cognitive development occurs first on a social level rather than at the individual's internal level as proposed by Piaget. Thus, according to Vygotsky's social constructivist learning theory, meaningful learning that can stimulate greater cognitive growth or lead to lifelong retention of knowledge occurs when learners are engaged in social activities such as interaction and collaboration with other people (Amineh & Asl, 2015). Vygotsky further recognized the zone of proximal development (ZPD) as a key aspect in his learning theory: the ZPD is "the distance between the actual developmental level as determined by independent

problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). This indicates that meaningful learning occurs in a guided and collaborative environment where someone or something more knowledgeable or at a higher level of cognitive capacity regarding a particular task, process, or concept is present to help learners to reach the ZPD (Hunter-Doniger, 2018; Rogers & Sun, 2018). Knowledgeable guidance can come from a teacher, a peer, an electronic tutor, or an electronic learning program.

Features of Project-Based Learning

Through extensive research on and constant refinement of project-based learning activities, Krajcik and Shin (2014) identified six key pedagogical features essential in project-based learning environments. Meanwhile, Condliffe et al. (2017) compiled additional activities recommended by various researchers in PBL. Features and activities of PBL, as delineated in this section, can provide online art professors ways to create a holistic project-based learning environment.

Driving Questions

PBL begins with asking substantial and challenging questions that are (a) "feasible" in that students can practically design and perform investigations on the questions and find solutions to the questions; (b) "worthwhile" in that students can perceive the impact of their projects in the real world; (c) "contextualized" so that the questions are relevant to students' lives and echo professional concerns in real-world situations; (d) "meaningful" so that students can feel invested and motivated to address the questions; and (e) "ethical" in that students adhere to the ethical standards of the discipline (five keywords drawn from Krajcik & Shin, 2014, p. 281; descriptions added).

Focusing on Learning Goals

The purpose of PBL is to facilitate students' achievement of the curricular objectives and standards set forth by the discipline. Thus, the professor necessarily guides students in designing their projects, resulting in the acquisition of disciplinary knowledge, skills, and cognitive abilities reflecting the standards of the discipline, ranging from specific content knowledge to professional guidelines to academic skills.

Engaging in Authentic and Discipline-Based Practices

Krajcik and Shin (2014) experimented with PBL in science classrooms and have identified a feature they called "engaging in scientific practices" (p. 276). Because PBL has been successfully applied to a variety of disciplines, the name of this feature has been modified by the author of this article to capture both Krajcik and Shin's principle and a principle promoted by other PBL researchers (Condliffe et al., 2017; Hunter-Doniger, 2018; Laur, 2013). This feature primarily emphasizes the authentic inquiry students should undertake by adhering to discipline-based or

professional processes, tools, and quality standards or by making a real-life impact through end products of their projects. Hunter-Doniger (2018) recommended several examples of authentic and arts-based inquiries ranging from "making scientific observations through painting" to "sketching animals and hypothesizing environmental issues" (p. 50).

Collaboration

Students collaborate with peers, instructors, or community members to generate ideas and find answers to the driving questions. Collaboration enables students to be guided by others who are more knowledgeable in the subject matter or possess stronger cognitive capacity through which students can acquire additional ideas, methods, or competencies to respond to the driving questions. Collaboration also resembles how professionals work together in real-world situations to solve problems. For example, art and art education professors acknowledging the techno-social realities of digital learners have employed such technologies as Web 2.0 and the three-dimensional virtual world to sustain collaborative activities to enhance students' arts-based research processes (Sweeny, 2010).

Using Technology Tools to Support Learning

While embarking on the inquiry process, students use technologies to assist and improve their learning. The professor and students should select technology primarily for educational—not only social, motivational, or entertainment—purposes. Technology can include cognitive tools that provide information, facilitate students' investigations of driving questions, or are required in the discipline. Online art professors have documented various student projects, highlighting the promising aspects of learning with technologies. Examples include students employing Google Earth to observe architectural details, using the Internet to find information, perusing artworks in the prominent virtual museums, using free online art software to create digital art, or applying a teleconferencing tool to share data and work on projects with others at a distance (Boss & Krauss, 2014; Holland, 2006; Lai, 2020; Sweeny, 2010).

Creation of Artifacts

Students create tangible products as the solutions or representations of the solutions to the driving questions. This feature is particularly aligned with an artmaking requirement in the discipline of art. The products can be presentations, scientific models, artwork, short stories, digital games, or web sites, allowing students to publicly demonstrate their acquired knowledge, skills, or answers to the driving questions. Through the artifact creation process, researchers in PBL (Condliffe et al., 2017; Hunter-Doniger, 2018; Lai & Cooper, in press) also believe that students are able to enhance their cognitive abilities by following the principle of learning by doing and gain experiential knowledge of the materials and processes used in the discipline.

In a review of PBL literature, Condliffe et al. (2017) uncovered additional, finer approaches to PBL: considering that students may be unfamiliar with PBL pedagogy and may be reluctant to propose driving questions, a warm-up "anchoring event" (Krajcik & Shin, 2014, p. 282) or an introduction is recommended to ease students into the PBL environment. Student voice and choice grant learners some degree of autonomy and responsibility in deciding what driving questions, working processes, and products are meaningful, relevant, real, and appropriate to them (Larmer et al., 2015). A comprehensive PBL program places projects as central, not peripheral, to the curriculum; hence, it requires sustained project cycles, including ongoing presentations of the project, self-assessment, reflection, feedback, and revision (Parker et al., 2013). Consequently, professors need to allocate ample time for students to complete project cycles. When feasible, students showcasing their end products to the targeted audience beyond the classroom is recommended; this is believed to strengthen students' motivation and commitment to devise and complete realistic and professional projects. The practices of project cycles and public presentation have a long history in art classrooms reaching back to the 16th-century sculpture and architecture schools (Larmer et al., 2015) as well as in contemporary digital art studios (Sweeny, 2010). Finally, in designing a PBL environment, the professor assumes a role as a guide, facilitator, project sounding board, or project codesigner and endeavors to create opportunities for students to fully perform PBL processes.

Designing Project-Based Learning in the Online Environment

To experiment with PBL in the online environment, a qualitative descriptive pilot study was conducted in an undergraduate online art course. Qualitative descriptive approaches have been adopted by clinical and classroom researchers to analyze and present data (Lambert & Lambert, 2012; Nassaji, 2015). The goal of a qualitative descriptive study is not usually to generate a theory or prove a hypothesis but to explain phenomena. A descriptive study is "more concerned with what rather than how or why something has happened" (Nassaji, 2015, p. 129); furthermore, such study should be mindfully selected "when a straightforward description of a phenomenon is desired" (Lambert & Lambert, 2012, p. 256). For example, a descriptive study can be highly relevant and useful when a need exists to explore and summarize what has occurred in a classroom and an educational process in a detailed manner and when the educational process involves instruction and instructional materials that are less known, new, or interesting to the targeted audience.

To this end, a descriptive account of the pilot study has been explicated here with focus on the pedagogical features, learning activities, and course structure. The pilot study was implemented in an online undergraduate women's art history course in fall 2017. It was a pioneer trial conducted in the author's department where more than two dozen online art courses were offered annually. To shed light on ways to create an online PBL art course, a descriptive qualitative method was deemed necessary. The author was the professor and researcher, who had taught this online course for eight years. The course had been developed as a general education course and attracted a large number of students majoring in subjects

other than art. During the pilot study, the author modified the original curriculum and transformed it into a PBL model. The majority of 20 enrolled students had previously taken at least one online course, but they lacked experience with online PBL art courses.

The women's art history online course was delivered through a course management system called Moodle. It comprised three content-oriented workshops surveying women's art in three historical periods. Instead of typically instructing the students to complete a range of assignments on different topics, the revised online course required each student to carry out only one arts-based research project throughout the entire 15-week long semester. Arts-based research prompts students to examine or create artworks that "raise awareness and foster critical consciousness by presenting alternative, emotional, evocative, attention-grabbing and/or resistive stories, images, and performances [and communicate] information about the experiences associated with differences, diversity, and prejudice" (Leavy, 2020, p. 25). Informed by this principle, students were expected to devise and conduct their own arts-based research projects to investigate real-world problems impacting women's lives.

In PBL, instructors need to create an environment where students' art projects are central to the course (Hunter-Doniger, 2018). Thus, a workshop entitled "Research Project" devoted to students' arts-based research projects was added to the online course. The title of and link to the workshop were placed on the course homepage so that students could immediately access the workshop and activities connecting to their and their peers' projects. This workshop encompassed a series of learning forums, each dedicated to a specific set of related activities helpful in encouraging students to follow PBL features to complete their projects. For example, the first forum, "Research Project Description," provided a description of the requirements and timeline of the project. Students were instructed to visit the forum and to ask questions about the requirements when the semester began. Each of the subsequent forums led the students to participate in specific PBL activities: (a) brainstorming project ideas including driving questions, (b) identifying resources and compiling a bibliography, (c) peer reviewing and discussing work-in-progress, and (d) submitting the final project. In addition, a learning forum entitled "Gallery Talk" was created for the students to submit and discuss their creative products, which had contributed to their research projects.

The "Research Project" workshop along with the associated PBL activities accentuated several key components noted in the literature review above. The configuration of the workshop was aimed at providing the students with a concrete and systematic way to accomplish project cycles consisting of ongoing peer reviews and discussions of the project, assessments, and revisions. Because the students were expected to periodically visit and comment on project ideas, resources, and works-in-progress from beginning to end, the configuration made possible a collaborative learning and research community. The students' learning process was scaffolded with technologies and tangibly manifested in multiple ways, including learning with the Moodle classroom tools and employing the digital tools in the art disciplines to create their projects. For example, the students were able to use the

asynchronous and synchronous communication apparatus to view and discuss their projects, access the reliable image repositories via the college's online library, and stroll around selected virtual museums via the hyperlinks embedded in the discussion forums. The students could create digital art, complying with the professional standard to upload their artwork-in-progress to the designated learning forums and receive peers' and professor's timely feedback.

Students Performing Project-Based Learning

The six PBL features are used as a framework in this section in which the project-based learning activities are enumerated and illustrated by two students' examples of arts-based research projects examining the issues around (a) procreation and (b) employment inequality in the artworld and global farming practices, all from a critical gender standpoint.

Driving Questions

A set of overarching questions reflecting the course subject of women's art history was initiated by the author-professor to guide the students in brainstorming their own questions: What was or is one gender-based issue in society that has impacted your life? How have artists addressed the issue through a creative means? Class discussion of these questions served as a warm-up anchoring event to entice students to reflect on the real-world controversies they deemed relevant to their lives. For example, based on personal experience and concerns of gender norms in procreation, one female student majoring in nursing questioned the social, physical, and psychological consequences of infertility and explored how Frida Kahlo (1907–1954), a renowned Mexican painter in the U.S. art world, depicted her struggles with procreation in her paintings. Another female student majoring in art and perceiving herself as a victim of patriarchal society was concerned about the prevalent issues of the gender inequality women in various professions and times have experienced. She investigated the lives of the Renaissance artist Artemisia Gentileschi (1593–c. 1656) and 21st-century farmers, exploring such questions as the following: What equal employment challenges have women encountered in the history of art? What financial and agricultural challenges do female farmers, especially in third world countries, face today? How might artists help to shine a light on the issues of misogyny in the artworld and society?

Focusing on Learning Goals

Learning goals included several curricular requirements set forth by the School of Arts and Humanities, which obligate students to demonstrate an understanding of a selected art form and its creative process; study artistic practice in a variety of social and cultural contexts (e.g., gender-based, identity-based, and location-based contexts); exercise art-based research skills by using virtual libraries and art databases; and present a robust analysis of artwork created personally or by other artists. Students were asked to engage in discussion with peers and to offer constructive feedback about how their projects might address the learning goals during the brainstorming phase.

Engaging in Authentic and Discipline-Based Practices

The students used textbooks and other reliable art and scholarly resources to learn about different ways contemporary artists confront, portray, or publicize gender-based issues through art, enabling them to expand their queries of professional art mediums, artworks, and creative processes. Applying newly acquired knowledge, they created artistic products to demonstrate what they had learned and their responses to the driving questions. These activities fostered students' commitment to professionalism and authentic arts-based research. For example, the two students who investigated the controversies associated with procreation and the employment inequality in the artworld and global farming communities felt a sense of genuineness and importance about their projects when they perceived that their end products—artworks and research reports—may have a practical impact in raising awareness of misogyny related to parenthood in real life or empowering women in various professions who may be reluctant to point out occurrences of gender inequality to speak up.

Collaboration

As noted above, the online workshop facilitated students' partaking in the required and continual collaboration with peers. Students posted and discussed their work-in-progress with peers throughout the semester. Upon receiving feedback from the author-professor and peers, students had opportunities to improve their projects. Because students' driving questions were often derived from personal yet common experiences in contemporary society, some students tapped into people outside the classroom to generate data for their projects. For instance, the student looking into the matter of procreation had collected information from health professionals and other women who shared the concern. In contrast, the student investigating employment inequality in farming practices received helpful feedback from a peer in the course. This classmate had female friends in farming business and offered additional information comparing female and male farmers' roles in the farming business and noting gender-based pay disparity.

Using Technology Tools to Support Learning

The most frequently used components provided by Moodle, the course management system, included the text-based asynchronous online discussion tools and large-size (50 MB) audio and visual file uploading and receiving capacity. These enabled the students to engage in discussions about their projects, view or listen to peers' end products, and revisit comments made by self and others. Students' learning performance and progress were documented in the online course, which was helpful for them to continue reexamining and revising their projects. The students were strongly encouraged to use the college's online library, the Internet, and social media to find information, study current news, and gather ideas from people outside the course regarding art, social issues, and women's lived experiences locally, nationally, and globally. Moreover, the students researched prominent artists and artworks through arts databases online, including reputable virtual museums, image repositories, and open educational sources. Ultimately, they

created end products employing a variety of digital tools, such as digital cameras, professional digital design software, and other image manipulation tools. These technologies not only served as learning tools to permit rigorous research and project cycles but are also the required tools professional artists use in the 21st-century artworld.

Creation of Artifacts

Students' end products included a plethora of research reports and artworks demonstrating what they had learned and their responses to the driving questions. For example, the nursing student who undertook research on procreation and infertility created a digital photo collage, consisting of an infant, surrounded by a series of pictures of medical equipment, needles, and charts. She lamented: "The patriarchal norm associating women with fertility, along with the innate desire to conceive a child, cause women suffering from infertility to experience a multitude of all-consuming emotions and a sense of incomplete womanhood" (Personal communication, December 11, 2017). Her photo collage and research echoed the theme of frustrated motherhood in surrealist artist Frida Kahlo's paintings and life. By incorporating realistic images and medical objects like an arm showing an intravenous line, medical tools, and a picture of infant in the photo collage, the student also exhibited an understanding of Kahlo's artistic methods and the feminist approaches embedded in her paintings. In peer discussions, several female students shared the sentiment revealing perpetual gender norms that have led them to continue to be burdened by the obligation to fulfill motherhood through biological childbearing. They further expressed that they have also resorted to discretely enduring the psychological and physical pain caused by the infertility treatments rather than following alternative ways of achieving motherhood.

The art student who explored the gender-based challenges of equal employment opportunity in the artworld and farming communities created a poster-like graphic artwork. She learned that both worlds shared similar misogynistic practice and that artist Artemisia Gentileschi had employed art to display women's strength in counteracting the patriarchy. She discovered that U.S. farm policy has resulted in barriers to women's achievement of financial independence through farming and that male farmers earn substantially more money than female farmers in the U.S. In other countries female farmers work longer hours than men tending farms and completing domestic chores; however, women are still denied access to land rights that are essential for them to sustain a farming business and grow and produce food for their families. These problems can also be seen in the Renaissance artworld where female artists were deprived of the necessary resources and the respect they needed to obtain financial and artistic independence. The background of her poster was occupied by three dark-skinned female farmers carrying baskets filled with green products of the harvest on their heads and walking in a field overgrown with tall brown plants. She brought the text "empower women, end world hunger" to the foreground to dominate two thirds of the poster. This poster seems to exude hope for female farmers, suggesting their role in ending world hunger. Using the design software Adobe Photoshop, she manipulated the images and text in a way that resembles professionally designed graphic art. One student praised the quality of

the artwork and suggested that this end product can bring real-life impact, if "it could be used as a bumper sticker or on some promotional items to advocate the cause" (Personal communication, December 14, 2017).

Two students had effectively performed PBL. Their research reports and artistic products incorporated their research findings and responses to the driving questions; displayed a fundamental understanding and application of the elements of art, principles of design, and digital tools used by professional artists and graphic designers; demonstrated their studio art skills; and met the discipline-based learning goals.

Final Reflection and Recommendations

The primary intent of the current article was to introduce project-based learning and elucidate ways to create a PBL environment in an online art class. Aligned with the six features of PBL (Krajcik & Shin, 2014), this article enumerated PBL activities supporting student arts-based research projects. Krajcik and Shin's (2014) PBL model emphasizing the use of technology to support learning, collaborative learning, and the creation of artifacts for demonstrating the learning outcomes appeared to coincide with the digital learners' cognitive preferences, the online course setting supported by Moodle, and the disciplinary and professional requirements in art. Moreover, the two students' performances of PBL, indicating deep learning of their chosen subject matter, corroborate other successful examples showcased in PBL literature (Boss & Krauss, 2014; Condliffe et al., 2017; Krajcik & Shin, 2014; Vaz et al., 2013). Thus, this study can provide information that may benefit online art professors.

The pilot study revealed that this online class was suitable for PBL. Several recommendations can thus be made here. First, in online classrooms, a centralized project space can expediently enable students to share their projects-in-progress and participate in ongoing review and discussion of their own and their peers' projects as frequently as they wish. Professors can require students to do so routinely to help ensure a solid learning community, practice of project cycles, and steady progress. Second, the pilot online classroom was configured to include text-based asynchronous discussion forums corresponding to the phases of PBL and large-size audio and visual file uploading and viewing capacity as well as access to online arts databases, social media, and virtual museums. These technology-generated resources can significantly contribute to successful PBL in online art classrooms.

Third, to encourage students "partnering" with technology (Prensky, 2010), the author-professor welcomed students' selection of the technology appropriate for their learning projects and preferences. The projects of the nursing and art students revealed that they acquired a range of technologies to conduct research, view artworks online, and create a photo collage and digital art. This echoes PBL researchers' assertion that project-based learning can strengthen student-centered inquiry processes and students' ability to become independent learners (Boss & Krauss, 2014; Boss & Larmer, 2018; Condliffe et al., 2017; Laur, 2013; Vaz et al.,

2013). Forth, online classrooms can offer certain advantages to practice PBL that may not be readily available because of the time and space constraints of face-to-face learning environments; for example, online classrooms can be equipped with convenient access and continuous opportunities supporting robust peer collaboration that can turn technology into a core and "natural" learning partner rather than an extra tool or burden in the educational process.

Challenges pertaining to PBL in online art classrooms should also be recognized. In the pilot study the students were unable to observe each other's artmaking face-to-face and offer immediate feedback on art mediums, styles, and techniques. Students who had limited artmaking experience found it intimidating to create artworks in isolation; thus, they tended to express modest self-assessment about the artistic aspect of their end products. In the long run, such a learning experience may diminish their interest and achievement in art. Another challenge pointed toward the professor's role in facilitating student online discussions. Although the driving questions and self-selected artworks were impactful and meaningful to the students, their deep investment in personal and private questions at times provoked highly opinion-based and uncritical discussions of individual affairs and feelings. Students could become offended, dejected, or silenced if their peers and professor did not express the expected empathy toward them or agree with their sentiment and interpretation of art.

To prevent or remedy these online learning situations, using the Moodle asynchronous communication tools, the author-professor had assisted individual students in choosing art medium suitable for their artmaking experiences and projects. Encouraging students to visually document and discuss with peers their artmaking process was another strategy facilitating students' artmaking experience. Alternatively, professors can take advantage of online videoconferencing tools to arrange synchronous meetings to assist less experienced students in making art. Professors can also create a prolonged or inclusive anchoring event, providing students with guidance to critique art, exercise constructive criticism, and undertake critical dialogue about personal and social issues. These instructional strategies may pave ways for more effective discussions of art and social issues in the online classrooms. After all, Prensky (2010) pointed out that in the 21st-century digital age, "asking good questions, providing context, ensuring rigor, and evaluating the quality of students' work" (p. 3) are still important teaching responsibilities.

When planned carefully and systematically following the theoretical foundations and pedagogical principles, PBL can be a liberating and promising pedagogy for online art classes. PBL supports the kinds of cognitive inclinations, technology usage, and learning processes favored by 21st-century students. PBL can be effectively implemented in the online environment; however, as online courses continue to grow across different disciplines, large-scale research will be necessary to contribute to the long-term success of PBL online.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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