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The Aesthetic Experience, Flow, and Smart Technology: Viewing Art in a Virtual Environment

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2016

Abstract

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by

Carol Foster Ikard

MA, University of Texas at El Paso, 1990

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

Smart technology can support art educators and museum professionals in mediating the aesthetic experience. It can also increase museum attendance, enrich the viewer's delight and engagement with artworks and art collections, and provide an avenue for extending art on a global level. The purpose of this study was to determine the extent to which a mobile art app with text-based narrative influences scores on an aesthetic experience questionnaire. This quantitative research measured the difference in pretest and posttest human-computer interaction scores on the *Aesthetic Experience Questionnaire Form* after participants used two versions of a mobile art app. Csikszentmihalyi's flow was the theoretical framework. After the administration of the pretest to 67 participants, 25 participants successfully viewed an art app with or without verbiage and then completed the posttest. Results revealed a significant ($p < .001$) mean increase in questionnaire scores among the group that used the app with verbiage (mean difference = 0.41), but no significant improvement among the group that used the app without verbiage (mean difference = -0.03). These findings indicate that certain mobile technologies are capable of mediating an aesthetic experience. Future research may provide information to educators and museums about the quality of the aesthetic experience. This information may increase and enrich human aesthetic experiences with art and may assist to develop human understanding of different perceptions that ultimately engender inclusivity and positive social change.

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Dedication

This dissertation is dedicated to my three children, Frank Neville Ikard, III, Jean Hunter Ikard Angove, and Charles Foster Ikard in appreciation for the sacrifices they made “because mother is studying.” Throughout the years of graduate studies when I was sequestered and preoccupied, their imaginations, resilience, and innovations in meals, transportation, and entertainment continuously inspired me with their capacity to survive and thrive. Now, the playfulness of my grandchildren, Avery, Alistair, and Windsor, sustained me through my doctoral studies. They reminded me this study was for the benefit of their generation in perpetuating the perceptual heirlooms art provides in the artful game of hide-and-seek.

Acknowledgments

I would like to acknowledge and thank Dr. John Flohr who patiently guided me through the dissertation process until my mind opened to new understandings. I am so appreciative that he knew how to give options over suggestions that assists strong willed people in their pursuit of new thought, new theories, and new processes. His own depth in the arts and sciences continually Flohr-ed me, and his patience inspired me to live more gently in every conversation and conflict. I am grateful that he introduced me to the breadth of Vigotsky, Dewey, Csikszentmihalyi, Gardner, and Eisner. Without Dr. Flohr, I could not have completed this work and fulfilled this goal. Dr. Estelle Jorgenson, also, gave me insightful input enriching my learning experience and opening my mind to the brilliance of Langer, Greene, and her own. At times her evaluative comments nudged me from being definitional to discussional, challenged my assumptions, and continually directed me to the deeper insights of others and my own. For these, I am humbled and grateful. Dr. David Stein was of tremendous help in focusing my attention on the purpose of this study.

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Chapter 1: Introduction to the Study

For centuries, happiness has been of interest to philosophers and theorists (Aristotle, n.d.; Aquinas 1911; Csikszentmihalyi, 1975, 1990; Jung, 1933, 1973; Maslow, 1954; Rogers, 1963). In a study of happiness as a peak experience, Csikszentmihalyi (1975) developed the flow theory. Later, Csikszentmihalyi and Robinson (1990) researched whether flow equated with the aesthetic experience and developed an aesthetic experience questionnaire to quantitatively scale the concept.

Previous researchers of flow and the aesthetic experience revealed how technology supports the research ventures of the two constructs to advance knowledge (Chang et al., 2014; Finneran & Zhang, 2005; Liao, 2007). Aesthetic and museum educators want and need to know the boundaries and possibilities of technology and art (Proctor, 2011; Simon, 2010; Smith, 2009). The advancement of each technical object contributes to this need to understand these boundaries and possibilities (Finneran & Zhang, 2005); therefore, a research is needed to determine whether an aesthetic experience is possible when using the current technology of a mobile device to view art.

More knowledge about art and technology will extend cultural understanding and may generate inclusion and social change. Major sections of Chapter 1 include the background, a problem statement, the purpose of the study, research question and hypotheses, the theoretical framework for the study, the nature of the study, definitions, assumptions, scope and delimitations, limitations, the significance of the study, and a summary.

Background

Over the past 25 years, researchers have developed the field of technological mediation of the aesthetic experience. Studies exist in relation to those interested and educated in the arts and technology (Chang et al., 2014; Di Serio, Ibanez, & Kloos, 2011), but "adapting the phenomenon of flow to computer users shows high inconsistencies and discrepancies in the literature" (Finneran & Zhang, 2005, p. 82). Researchers of various disciplines and digital technology (e.g., Carr, 2012; Chang, et al., 2014; Di Serio, et al., 2011) revealed that technology successfully supported their endeavor for knowledge in flow or the aesthetic experience or within a discipline. Research in mobile technology is limited because the release date of iPhones was 2007. However, researchers have explored flow and applied technology in the area of medicine, nursing (Ahern, 2005; Wardini, Dajczman, Yang, & Baltzan, 2013), business (Hoffman & Novak, 2009; Nielsen & Cleal, 2010; Thaler & Tucker, 2012), and sports (Delespaul, Reis, & DeVries, 2004; Dillon & Tait, 2000; Jackson & Csikszentmihalyi, 1999; Schuler Brunner, 2008; Stein, Kimiecik, Daniels, & Jackson, 1995).

In the arts, research is lacking in the facilitation of the aesthetic experience (Csikszentmihalyi & Robinson, 1990). Further, a gap in the literature exists in whether mobile technology, specifically smart phones, is a help or hindrance in experiencing art. Further, studies in flow and computer-mediated environments (CMEs) are needed in relation to art and the aesthetic experience in particular. Such studies may guide or contribute to education and the arts and technology industries. Additionally, these studies

may help develop the new trend of eMuseums (Baillargeon, 2008; Locher, 2011) and help individuals enrich their lives through art.

Problem Statement

No empirical study was found relating to a combination of aesthetics and smart technology. The problem is the lack of available research-based information relating to visual arts and mobile technology and whether viewing art in a cell phone application influences the aesthetic experience (Finneran & Zhang, 2005). In the context of online activities, "less is known about the factors that make using the Web a compelling experience for its users…" (Hoffman & Novak, 2009), as "flow is ill defined in CME" (Finneran & Zhang, 2005, p. 83). In schools, aesthetic educators look for ways to increase student engagement with the arts. Museums curators look at ways to redirect viewers' attention from leisure competitors to regain attendance and enhance the enjoyment of their art collections. Aesthetic educators and museum educators teaching visual arts courses do not know if smart technology can heighten the aesthetic experience. It would be of use to these educators to determine whether contextually changing the experiences with technology is the solution to facilitate the aesthetic experience and regain engagement and audiences. More research is needed to confirm the best technology to use. By quantitatively measuring the differences in scores in a questionnaire, this study explored whether looking at art in a cell phone application influences the viewer's aesthetic experience.

Many researchers have explored the theory of flow or the aesthetic experience to computer users; however, each technological advancement diminished the relevance of

the research. While researchers reported positive results with technology, most studies relating to the aesthetic experience and technology used other technologies or were developed prior to smart networks (Carr, 2012; Chang et al., 2014; DiSerio et al. 2011; Finneran & Zhang, 2005; Jennett, 2010, Marlow & Dabbish, 2014). As the tool changes, research of the interactive task at hand becomes important. Finneran and Zhang (2005) documented their work in examining flow in CMEs and noted that it is not so much the tool but the capacity the technology afforded to have the optimal experience. They found positive attitudinal change but did not specify a particular information communication technology (ICT).

Experimental research is lacking on whether current, smart technology has influenced affect (Salah, Hung, Aran, Gunes, & Turk, 2015). Research is needed to identify effective mobile technology-based educational programs that contribute to viewers' aesthetic experience (Locher, 2011; Simon, 2010; Smith, 2009; Stein, 2010). In the present study, I looked at human-computer interaction and postmedia aesthetics of viewers experiencing technology and cultural data and whether they form an aesthetic interaction (Hsieh, 2011; Manovich, 2001, Marković, 2012). In this study, I explore whether technology can redeem the value and frequency of the aesthetic experience in the visual arts. The results of this study may help to fill the gap in research literature of whether using smart technology mediates and engenders the aesthetic experience.

Purpose of the Study

The purpose of this quantitative study is to determine the extent to which a mobile art application with narrative influences scores on an aesthetic experience questionnaire.

The results of this quantitative study may help to assess a change in attitude through participants' self-reporting of an aesthetic experience after using a nonspecific exhibit mobile application (app) featuring art. Participants were adults between the ages of 21 to 80 who have minimal education in aesthetic education (i.e. nonmuseum professionals). Participants' prior art knowledge is self-reported (Section A of the Aesthetic Experience Questionnaire Form [AEQF], Appendix A). Data were analyzed for the difference in the questionnaire scores.

The dependent variable is the change in subjects' attitude toward the aesthetic experience as measured by the AEQF questionnaire. Stated reductively, the dependent variable is the aesthetic experience (ΔAE). For this study, Csikszentmihalyi and Robinson's (1990) definition of the aesthetic experience as "an intense involvement of attention in response to a visual stimulus, for no other reason than to sustain the interaction… characterized by feelings of personal wholeness, a sense of discovery, and a sense of human connectedness" (p. 178) were used. The dependent measure is the AEQF by Csikszentmihalyi and Robinson.

The independent variable is use of the mobile application; the experimental group viewed the mobile app with narrative and the control group viewed the mobile app without narrative. The independent variable requires using the application on a mobile smart or cellular device. The last question on the questionnaire asks for verification of the technology used. The focus of the study addresses the convergence of aesthetics, emotions, and digital technology and the impact of aesthetics and human behavior.

Research Question and Hypotheses

Research Question

The research question that guided this study is: To what extent do differences exist, if any, between participants' pretest and posttest scores on the Aesthetic Experience Questionnaire Form (AEQF) after participants use the mobile app with narrative versus the mobile app without narrative?

In this study, I examined the relationship between the mobile application and self-reported aesthetic experiences. Research is needed to determine if viewers report having an aesthetic experience when seeing art on a smartphone screen. I addressed this issue by quantifying the differential between participants' pretest and posttest scores on the AEQF before and after undergoing a mobile app intervention. I also compared the differential scores to a control group.

Null Hypothesis

$H_{0:}$ There will be no difference in pretest and posttest AEQF scores among participants who have used the mobile app with narrative versus using the mobile app without narrative.

Alternative Hypothesis

H_a: There will be a difference in pretest and posttest differential AEQF scores among participants who have used the mobile app with narrative versus using the mobile app without narrative.

The scores on the Likert-scaled AEQF, as self-reported by participants, quantified the aesthetic experience. I measured the dependent variable (engaging in aesthetic

experience) by comparing the pretest and posttest scores from the AEQF Likert scale answers, specifically by disaggregating Part B, Question 10, and Part C, Question 10. Participants took the pretest, then viewed an application, and took a posttest. There may or may not have been a change in attitude about their aesthetic experience after viewing art on a cell phone. Whether participants reported having an aesthetic experience, synonymous with attaining flow, after viewing art on a cell phone is the objective of this study. Detailed discussions on the nature of the study, research question, and hypothesis appear in Chapter 3.

Theoretical Foundation for the Study

For this study, Csikszentmihalyi's flow theory (1975, 1990) provided the parameters for measuring the existence of flow, an optimal experience. Flow and the aesthetic experience paralleled each other with Beardsley's (1982) criteria for the aesthetic experience and Csikszentmihalyi and Robinson's (1990) criteria of flow. In this study, flow was equated with aesthetic experiences as Csikszentmihalyi and Robinson (1990) determined quantifiably that flow and the aesthetic experience have equivocal or parallel characteristics and correlate with the criteria for the flow experience.

The original research and theoretical model of flow were reported by Csikszentmihalyi in 1975. Later, Csikszentmihalyi and Robinson (1990) explored the flow theory in relation to art and found that humans want to understand themselves and their world and want to know what something means. Researchers have applied the flow theory to other human endeavors (Admiraal, Huizenga, Akkerman, & ten Dam, 2011; Csikszentmihalyi, 2014; Dillon & Tait, 2000; Jackson & Csikszentmihalyi, 1999; Min,

Delong, & LaBat, 2015; Schuler & Brunner, 2008; Webster, Trevino, & Ryan, 1993), and other researchers used flow as their theoretical foundation (Chang et al., 2014; Finneran & Zhang, 2005; Serrano-Puche, 2015; Webster et al.,1993; Zhang, Feng, & Chan, 2011).

Csikszentmihalyi and Robinson (1990) researched the aesthetic experience with museum professions through interviews and a questionnaire and proved the aesthetic experience equated with the requisites of flow. The key elements of flow include setting a goal, engaging in a task or activity that is autotelic, and reporting transcendent experience, but with a sense of control to recalibrate activities when needed. Preconditions exist that facilitate flow and the aesthetic experience, such as a slight imbalance between challenge and skill set and an autotelic personality. One preeminent feature of flow is that it articulates an individual's present experience rather than reliance on past experiences and memory (Moneta, 2012).

Chapter 2 includes the contributions of these studies and their strengths and weaknesses in their determined efforts to advance knowledge on human behavior. Chapter 2 also contains a more detailed account of the elements of flow and the conditions for flow and the findings of studies related to the aesthetic experience. I review other studies about technology and transcendence in the areas of entertainment and education that contribute to this study and confirm transcendence with technology prior to smart technology (Alexander, 2003; Chang et al., 2014; Fang, Zhang, & Chan, 2013).

Instead of a reductive approach, Csikszentmihalyi and Robinson (1990) explored in interviews and with questionnaires how museum professionals related to art in their

thoughts, feelings, and goals. The museum professionals' expertise about the aesthetic experience validated that the aesthetic experience is "culturally defined as well as from personal meanings developed throughout an individual's life" (Csikszentmihalyi & Robinson, 1990, p. 17). Csikszentmihalyi and Robinson's findings are the foundation of the present study to discover whether the flow experience, the aesthetic experience, can occur with nonmuseum professionals when viewing art using digital technology that did not exist at the time of Csikszentmihalyi and Robinson's 1990 study.

Whether nonmuseum professionals or novice viewers of art can aesthetically transcend on a smartphone, to my knowledge, has not been researched. In this study, the dependent variable relates to the flow theory and the aesthetic experience. The dependent variable is the change in the subjects' attitude toward the aesthetic experience as measured by the AEQF (Csikszentmihali & Robinson, 1990); the attitude is self-reported by novice viewers of art. The AEQF quantifiably measured the research question by noting specifically if participants observe a change in attitude after focusing on the task of viewing virtual art using the mobile app with narrative versus the mobile app without narrative.

Nature of the Study

Experimental design is a classic approach in educational research for determining the effects of an approach or instrument (Frankfort-Nachmias & Nachmias, 2008). I used a randomized experimental design with an experimental group and a control group. In this quantitative study, I used a randomized experimental design with an experimental group and a control group, with both groups using a pretest and posttest (Campbell &

Stanley, 1963; Frankfort-Nachmias & Nachmias, 2008) to investigate any change in scores in relation to aesthetic experiences. I compared an experimental group to a control group using different strategies designed in two differing apps. I verified that the application was used on a smartphone, a hand-held device with a small screen. The groups were randomly assigned and the experimental group was exposed to the independent variable, the app with verbiage or some narration. The control group was exposed to the app with the same artwork but no verbiage. To assess the effects of the independent variable (use of the mobile app), I compared pretest and posttest scores on selected items on the questionnaires. The dependent variable is the subjects' attitude toward the aesthetic experience as measured by the AEQF. I used a pretest and posttest with both groups to investigate any change in scores in relation to aesthetic experiences.

Participants were directed to PsychData, an online research company, and randomly assigned to one of the two groups. The random assignments to experimental and control groups assisted with validity in the study. Participants answered questions in a pretest and then proceeded to the treatment, followed by the posttest questionnaire. The data were analyzed by SPSS, and the test statistics reported a *t* value and a *p* value.

The effect size was a determining factor in this study because the difference in the means between the experimental and control groups that indicated the strength of the existing relationships. I used G*Power to test the probability of the effect of the app (Field, 2000). Because I was interested in the difference between the differential scores from the experimental group and the control group using a repeated questionnaire, I estimated the required sample size using a *t* test of a means differential between two

independent means (two groups). The rationale for the quantitative statistical analysis (i.e., *t* test) is to determine the influence on aesthetically appreciating art after an intervention, a protocol, with a mobile application. I used a *t* test to determine the significant difference between two sets of data. The conclusions of the research were based on whether "the differences in the experimental group is significantly larger than in the control group, [then] it is inferred that the independent variable is causally related to the dependent variable" (Frankfort-Nachmias & Nachmias, 2008, p. 90).

I followed Walden Institutional Review Board (IRB) considerations meticulously after the study and methods were approved. I saw few risks in using adults, and the selected artworks are, for the most part, museum pieces. The IRB also approved potential risks and benefits to the participants, data integrity and confidentiality, and informed consent and electronic signatures.

Definitions

The following definitions provide conceptual uniformity. More detailed descriptions are provided in Chapter 3.

*Aesthetic education: "*is a process of empowering diverse persons to engage reflectively and with a degree of passion with particular works of art…enabling people to release their imagination, to ponder alternative ways of being alive and... become more awake to their surroundings" (Greene, 2001, p. 170).

Aesthetic experience: a psychological state of mind "involving firmly fixed attention, relative freedom from outside concerns, affect without practical import, exercise of powers of discovery, and integration of the self" (Levinson, 2003, p. 10); an

optimal experience (Csikszentmihalyi, 1990, Cskiszentmihalyi & Robinson, 1990). (Within this study, the aesthetic experience will be discussed as a change in attitude as indicated, expressed, and measured as a difference between scores on pretests and posttests. Aside from the clinical approach to the definition, it can subjectively be defined as transcendence, elation, and various emotional responses: joy, sadness, or empathy.)

Aesthetic Experience Questionnaire Form (AEQF): created by Csikszentmihalyi and Robinson (1990) for the purpose of measuring reported aesthetic experiences (p. 193).

Aesthetics: a philosophy of appreciating art and concerned with beauty and sensory pleasure or responses (Csikszentmihalyi & Robinson, 1990, p. 5).

App: **"c**ommon abbreviation for application program, which refers to any body of code that performs a task when installed on a given operating system" (Proctor, 2011, p. 103). An app is computer software. In this study, app refers to *Breaking the Glass Wall in Art Appreciation* (BGWA).

Augmented reality (AR): "the 'real world' overlaid with digital content to create a multi-sensory experience. Audio tours are the original augmented reality…" (Proctor, 2011, p. 103). Today, smartphones and tablet computers deliver AR as a location-based service (Proctor, 2011).

Autotelic: doing an act for the sake of the activity. Autotelic nature does not need eternal rewards and the act is intrinsically satisfying (Csikszentmihalyi & Robinson, 1990, p. 8). An autotelic personality is someone who has the capacity to enjoy an activity for its own sake (Csikszentmihalyi, 1997b, p. 116).

Breaking the Glass Wall in Art Appreciation (BGWA): an art app designed for enhancing art appreciation and the aesthetic experience; located online at glasswall.mobi.

Device: a term used to describe computer hardware (Proctor, 2011).

Educitizens: citizens teaching themselves about various topics on hand-held devices (KnowledgeWorks & the Institute for the Future, 2008, p. 2).

Flow: an optimal experience when fully engaged in an activity; in the zone (Csikszentmihalyi, 1997a).

Global positioning system (GPS): "a line-of-sight location-based technology that uses satellites to identify and relay the user's geo-coordinates" to an artifact such as a mobile device (Proctor, 2011, p. 105).

Human Computer Interaction (HCI): the study of human computing behavior in computer-mediated environments (Finneran & Zhang, 2005).

Hypertext markup language (HTML5): refers to a simple standard that governs the writing and rendering of web pages; version 5 allows the development of richer interactive content to run on mobile and portable devices (Proctor, 2011).

Mobile device: a handheld portable piece of equipment such as a smartphone or tablet.

mLearning: refers to learning with a mobile device and is used in formal and informal learning opportunities (MacCallum & Jeffrey, 2009).

Mobile website: "a website optimized for access via a mobile device rather than a laptop or desktop computer" and are formatted for small screens (Proctor, 2011, p. 107).

Massive open online course (MOOC): a course of study made available to a very large number of people over the Internet without charge (Dictionary.com).

PsychData: a large technology company that provides online software to create surveys and questionnaires and provides data analysis in real time and sample selection.

Smartphone: a device with "Internet connectivity enabling it to provide access to apps and websites" (Proctor, 2011, p. 111). Screen sizes vary from a range of 2 inches by 5 inches (mLearn Summary Report, 2012). Technically, screen size is measured diagonally and in pixels.

Transcendence: is a process that challenges to go beyond limits, while it defines us as creative beings (Marcus, 2014) in "operating below the threshold of human awareness and choice" and that indicates ways to acquire new skills and new sensibilities (Csikszentmihalyi & Robinson, 1990, p. 16).

Visual literacy: a process for understanding art and visual literacy also "involves making judgments of the accuracy, validity, and worth of images" (Bamford, 2003, p. 1).

Assumptions

I assumed that participants concentrated on the artworks in the app, were engaged in looking at art on the screen, and answered the questionnaire with honesty. I also assumed that participants had a curiosity for the existential context of art because participants received no monetary reward or incentive for participating. The study results relied on the generous spirit and integrity of the participants, some of whom are intrigued to some extent by art. Because the complexities of human nature often are speculative, these good faith assumptions are necessary to a degree when researching and explaining

human behavior. Csikszentmihalyi and Robinson (1990) held that the "experiences are subjective phenomena and therefore cannot be externally verified. Either one trusts the words of the person who reports the experience or one does not" (p. xiii).

I assumed that the AEQF as an instrument of measurement is an indirect representation for the participants' aesthetic experience and the resulting scores reflected their reported experience. The app itself may not implement the possible change in scores; rather, I assumed participants used the app from start to finish and engaged in the art. The data would be more accurate if the app was used in its entirety by both the experimental and control groups. I assumed the content of the apps are valid with reliable information as designed by a content expert with WIV Capital in 2014.

Csikszentmihalyi and Robinson (1990), who researched and published on the aesthetic experience, created the AEQF and used systematic analysis of participants' responses. As reported by Fullagar and Kelloway (2009), the original flow scale consisting of nine dimensions are a comprehensive measure of an optimal experience (Jackson & Ecklund, 2002) and are psychometrically acceptable (Jackson & Ecklund, 2002; Jackson & Marsh, 1996; Marsh & Jackson, 1999). In Csikszentmihaly and Robinson's application of the flow scale to the aesthetic experience, their study of the aesthetic experience, and their ensuing published work does not provide the mean alpha but is recognized as contributive in the field of aesthetics because it quantitatively measured what is considered a subjective entity and mostly is qualitatively studied. They assessed the internal consistency (Chronbach alpha) to draw their conclusions from 52 returned questionnaires [62%] (Csikszentmihalyi & Robinson, 1990).

Finally, I assumed that adult participants in the study had an autotelic personality to some degree and had the capacity to enjoy the activity of viewing art for its own sake. Persons with autotelic personalities are intrinsically motivated, engage in activities for their own sake, and have the capacity for flow to some degree (Baumann, 2012; Johnson, Keiser, Skarin, & Ross, 2014). Non-autotelic personalities tend to experience only difficulty when the challenge is greater than their skill level, whereas autotelic individuals recognize opportunities to build skills (Baumann, 2012). A validated scale to measure flow, experimental sampling method, ESM, (Jackson & Eklund, 2008; Johnson et al., 2014) and dispositional flow scale (DFS-2) exist to test for autotelic personalities (Jackson & Eklund, 2002). However, I did not use the ESM and DFS-2 in this research because autotelic and non-autotelic personalities are not variables.

Scope and Delimitations

The viewer's aesthetic value in the experience is the scope of this study; the scope of the study does not include the externalism of the art object, only the internalism of the attitude or disposition. The focus of this study is to research if immersion in art is possible on a small screen.

Internal validity relates to cause and effect and is secured by how well the research is conducted. In this study, the causal relationship involved whether viewing the art can generate the aesthetic experience in this case considered a change in attitude. The validity of the study's data relied on having the appropriate questionnaire, the wording of the questionnaire, and the proper sampling.

The setting in which a participant reviews the app could have been a delimitation if used in an environment of heavy activity and distractions. External validity and generalization was supported by randomization of the population assignments to groups. There were random group assignments.

Boundaries of applicability may have been an issue if any participants were not adept or familiar with computers or mobile devices. If participants had not comfortably assimilated their cell phone as "extensions of their body" (Serrano-Puche, 2015, para. 13), this may have delimited their engagement.

I made no attempt to compare Csikszentmihalyi and Robinson's (1990) findings with the findings of this study. The rationale is the distinct difference between Csikszentmihalyi and Robinson's expert and professional participants, as opposed to participants with no or little arts experience who are considered novice-viewers. Most ordinary observers of art know there is a message in the art if only they could read it. As precisely explained, "Most people when confronted with a work of art, simply do not know what to do. Without a goal, a problem to solve, they remain on the outside, unable to interact with the work. They do not even know what responses to make, what emotions might be appropriate to have" (Csikszentmihalyi & Robinson, 1990, p. 83). Nonmuseum professionals, mostly nonliberal arts majors like engineering and business majors, have not been tutored or educated on what to focus. However, from the focusing of attention, new skills and observations may develop with an attitudinal change about viewing art.

Potential generalizability to the greater population could have been a problem in this study because of the sampling size and because guidelines for selecting participants

are few. If I could have controlled the selection process more, I may have been able to make a logical assumption that the findings would apply in all or most cases with similar characteristics. Only further studies and larger participant pools could alleviate this situation.

Limitations

Limitations existed related to the design that included internal and external validity, construct validity, and confounder variables. For example, the concept of the aesthetic experience is complex, and no dependent measure can capture all the dimensions.

The many conditions under which an aesthetic experience occurs are not fully investigated, such as how using the app with other technology other than the smartphone compare to the findings of using a smartphone that has a screen size from 2 inches by 3 1/2 inches or 4 inches by 5 1/2 inches. That question would relate to whether screen size makes a difference in experiences. Other researchers found that the aesthetic experience is possible when looking at art on desktop screens and iPads (Carr, 2012, Chang et al., 2014; Finneran & Zhang, 2005).

Two apps were employed in this study: one app for the experimental group with general verbiage regarding historical, formal, and emotional context of selected art and another app for the control group that has the same art but no verbiage relating to art except titles, artist, location, and year. With the use of two groups and two distinct apps, the resulting data affirmed the findings regarding using the art appreciation app on a small screen and validated the findings.

While the responses are individuated and ambiguous, the extent of the responses was measured via a 5-point Likert scale ranging from *never true* to *always true*. Likert scales may fail to measure the true attitudes of participants, as participants may find the five choices limiting in description or restricting responses (Frankfort-Nachmias & Nachmias, 2008).

Using adult participants is limiting because these participants have had time to develop or deepen biases. Bias for or against types of art is a challenge, whether the bias is conscious or unconscious. Preconceived ideas regarding art and a dubious regard for the concept of the aesthetic experience may have limited participants gaining new knowledge in a field in which they are unacquainted or having new responses to art.

There may have been a sampling bias because no museum professionals were used in the study. Because they have encountered art on a sophisticated level, I presumed they would be unaffected or at least have a consistent response to viewing art online. This may have held true for many liberal arts majors who are participants educated to identify symbols and metaphors.

The app used by the control group requires less time; therefore, this could have been a confounder that disrupts causality. The longer a person views a painting, the more apt the viewer is to have an aesthetic experience (Leder, Carbon, & Ripsas, 2005; Locher, 2011). Without the verbiage in the app, participants may have hurried through the review of art and not examined the art with curiosity or not have made cognitive, experiential, and affective responses.

Reasonable measures to address these limitations included having participants volunteer. Volunteers usually do not participate in studies that do not interest them. Likert scales are limiting, but they are the most widely used method to capture and quantify feelings and responses. The control group app consisted of renowned and popular paintings; perhaps this captured participants' interests and engaged them.

Significance

Potential contributions of this study that advance knowledge in the areas of aesthetic experience will be determined in time. If the results of this study do not indicate a differential in pretest and posttest scores to improve participants' aesthetic experience, this may indicate that a mobile app is not effective for appreciating and engaging with art to the point of an aesthetic experience. The study results may gauge whether art and the science of technology mediate an experience that lifts a viewer beyond indifference and the mundane because "Creating art and viewing art…transcend normal human life and at the same time come into awareness of our deepest nature" (Hagman, 2011, p. 23). However, other contributions to the field of aesthetic education and research may effect social and cultural changes, as is the power of both art and technology (Misa, 2004; Shlain, 1991).

For researchers, this study is unique in quantifying to what extent a mobile browser-based application, developed in HTML5 (available via the Internet for all mobile devices), can influence to what extent HCI influences the nature of the aesthetic experience. Museum professionals may find this study illuminates new ways to deliver

art and fulfill their mission to connect and transport people to creativity, cultural knowledge, identities, and ideas.

The results of this study may help viewers become self-directed learners to enhance the creative and innovative thinking processes that are valued as 21st century skills (Bellanca & Brandt, 2010; Costa & Liebmann, 1997). Art also draws from their multi-intelligences to conceptualize, associate, and synthesize prior experience in creating new knowledge (Gardner, 2006). The imagination stimulated by seeing and discussing art can be a gateway for imagining what a better world would look like because experiencing art is an epistemology for finding value in life.

The study's findings may promote positive social change by providing insight into ways of developing meaning in art and in life. If transference occurs, participants may begin to analyze art with more insight about techniques and artistic standards. They may begin to analyze themselves, their community, and the world with more curiosity, empathy, and compassion, ultimately creating a world of inclusion. Learning such a process might ultimately generate more synergy, interaction, and innovation, and may have a more affective impact in the form of positive regard for people, places, and things that may generate a more inclusive world because "to change some dimensions of our perceiving, [may change] some dimensions of our lives" (Greene, 1995a, p. 140). Once insight occurs, generally acceptance occurs, instilling a message of hope for a more humane society (Jorgensen, 1996).

Summary

Researching whether viewers can appreciate art through technology, specifically smart networks, provides an increment of knowledge on the sensuous and contextual media of art and the aesthetic experience. Quantifying the extent to which an aesthetic experience can be measured contributes to the field of aesthetic education because experiencing engagement with art is active learning and sensing that is transferable to other challenging situations. In an era when knowledge is doubling in years, rather than centuries or decades, preparing students for all they will encounter is increasingly challenging. By experiencing art by exploring, investigating, interpreting, and enjoying art, individuals will be more prepared for their daily professional and personal challenges. The experience will provide a key for developing relevant knowledge and identities for the individual. This type of information is generally qualitative because the aesthetic experience is subjective.

The present study quantified subjective outcomes and provided new, quantified data from an aesthetic experience questionnaire in relation to engagement with art (Csikszenthihalyi & Robinson, 1990). In Chapter 2, I elaborate on the literature-based research that supports the conceptual value and contribution of the aesthetic experience and how technology is an instrument for attaining this concept.

Chapter 2: Literature Review

Introduction

The problem is the lack of available research-based information relating to visual arts and mobile technology and whether viewing art in a cell phone application influences the aesthetic experience. The purpose of this quantitative study was to determine the extent to which a mobile art application with narrative influences scores on an aesthetic experience questionnaire. The reason for this study was to quantifiably assess whether participants have an aesthetic experience after using a nonspecific exhibit mobile application (app) on art. In this study, the effects a mobile application has on individuals viewing art were assessed, compared, and analyzed. Research was needed in the areas describing to what extent art online contributes to viewers' aesthetic experience after participants view an art application (Locher, 2011; Simon, 2010; Smith, 2009; Stein, 2010). In this chapter, I review studies, upward findings, and theoretical possibilities that counter downward trends in aesthetic education and a loss in the enrichment of the visual arts.

The major sections of this chapter and the literature reviewed present the empirical research on flow in relation to various disciplines and in relation to various computer-mediated environments. A review of the literature provides concise summaries of the research on topics of flow, aesthetic experience, aesthetic education, computer-mediated environments in various disciplines and provides insights yielded within the literature that helped define significant proponents of the applied theory of flow to art. I review and associate the flow theory as aesthetic experience and review the literature in

how the theory is applied to art and technology. This chapter also presents further insights on what occurs when viewing art and how it occurs and provides a supportive research and theoretical foundation for verifying the present research on the aesthetic experience and digitized aesthetics.

Literature Search Strategy

To assess the current understanding of the relationships between mobile technology and the aesthetic experience, I used several search engines and knowledge resources, including Sage, Google Scholar, ERIC, EdITLib, Elsevier, Pro-Quest, Jstor, ArtsEdSearch, National Education Association, National Endowment for the Arts, and National Arts Partnership. Leaders in the arts, such as the Getty Museum, the Smithsonian Museum were a resource of information.

The key search terms included *art education, art appreciation, aesthetic experience, aesthetic education, art appreciation education, mobile education, cultural education, process-based education, top-down learning, bottom-up learning, eLearning, mLearning, visual literacy, cognitive skills, affective responses, aesthetic education, cultural technology, constructivism, metacognition, sense-data*, smart networks, and *digitization.*

Because technology changes so rapidly, I used only research articles and studies written within the 21st century with an emphasis on those within the last 6 years from 2009 to 2015 in relation to technology. However, I made a few exceptions because in 2004 and 2005 several studies on flow and computer-mediated activities were published that are relevant to this study (Finneran & Zhang, 2005; Pilke, 2004; Skadberg &

Kimmel, 2004). The reason for the limitation of 6 years of article coverage is that mass adoption of smartphones occurred with the Apple iPhone in 2007 and the Android in 2010. Prior to 2007, research relating to hand-held device technology was more about functionality, specifically that of multitouch interface that was nonexistent or was mostly used in corporate endeavors, such as IBM research (Speiser, 1998). Smartphone technology is new on the research landscape.

Current peer-reviewed literature was derived from *Journal of Aesthetic Education, British Journal of Aesthetics, Journal of Aesthetics and Art Criticism, Studies in Art Education, Journal of Educational Research, Acta Psychologica, Visual Arts Research, Psychology of Aesthetics, Creativity, and the Arts, Journal of Educational Technology Systems, Journal of Information Technology Education, Computers and Education, Journal of Museum Education, Journal of Visual Literacy, Educational Technology.* Articles from other publications also contributed to this study.

Theoretical Foundation

The formative literature influencing this study includes Csikszentmihalyi's (1975) work on the theory of flow as an aspect of the aesthetic experience in which the two concepts are "in reality indistinguishable from one another" (Csikszentmihalyi & Robinson, 1990, p. 9). The Deweyan idea of art as experience and Langer's (1979) philosophical sense-data also pervade this study. In this current study relating to digitized aesthetics, the concepts of experience and process may supplement flow and can be combined into a useful framework for understanding the problem at hand.

The theoretical framework of this study was Csikszentmihalyi's (1975, 1990) flow theory as an optimal inner experience with art. I applied and reviewed the theory within the parameters of the aesthetic experience and a computer-mediated environment. In this section I discuss the etymology of the aesthetic experience, the origin of flow, flow as the aesthetic experience, the four dimensions of flow, the three components of flow, the preconditions and context for aesthetic experiences. The present study dealt fundamentally with the aesthetic experience in a computer-mediated environment. First, a review the semantic precursor of flow, the aesthetic experience, is important. Second, I review the literature on reported aesthetic experience in a computer-mediated environment.

Aesthetic Experience Theories

The nature of an aesthetic experience is grounded in the vivid cognitive and affective perception experienced by the viewer of art and linked to the viewer's personal relevance (Vessel, Starr, & Rubin, 2012). The concept of the aesthetic experience has evolved over a long period of time and has taken on a broad variety of meanings. In 1509, Raphael depicted in the history of aesthetics in his *School of Athens* (Figure 1), with the profundity centralized in the fresco between Plato and Aristotle. Plato is pointing upward toward the heavens for truth implying art was of a spiritual nature, and Aristotle is pointing downward toward the earth as though art was about human nature. Plato signals a philosophical theorist approach, and Aristotle signals an inductive, empiricist approach to answers.

Figure 1. School of Athens. Raffaello Sanzio, 1509. Apostolic Palacio, Vatican City.

These early art philosophers contributed to the long flowing river of classical philosophy beginning with Pythagoras who espoused the musical ratio of orderly spaced spheres in art and music and "Know thyself and thou shalt know the universe and God." In this maxim, mankind looks outwardly and inwardly for what is of value: knowledge and understanding. To Socrates and Plato, the function of art was a recursive Droste effect of imitating, mirroring divine reality and was a means to "know thyself" as carved in the Delhi Temple. To Aristotle, art was imitated beauty, *memesis,* (*Poetics,* n.d.) and the approach to truth and meaning was inductive. Later, Western philosophy transferred the experience of art to religious mysticism or scholarship. In the 18th century, Kant espoused feeling and pleasure were essential properties of aesthetics (Kant, 1987; Stecker, 2005), Cartesian and Newtonian logic stressed exhilaration in art by intellectual thought (Guyer, 2005). Other luminous literati on aesthetics include 19th century existentialists Kierkegaard (1981), who developed the perspective of ethical-religious aesthetics and considered aesthetics in imagined possibilities of how people subjectively relate to themselves rather than to objective truths. He set no limits on God or truth and envisioned

man's existence in three states: aesthetics, to know the world; ethics, to know values; and religion, to know the ultimate in transcendent power. Freud (1925), who explored other dimensions of human consciousness and emotions, considered aesthetics as responding to unconscious urges (Glover, 2009; Wollheim, 1970). In the 19th century, Marxist aesthetics situated art as impatience with economic status quo, and Tolstoy (1979, as cited in Guyer, 2005) delivered art as promoting universal brotherhood. Baumgarten (1936, as cited in Csikszentmihalyi & Robinson, 1990) was the first to use the Greek adapted word *esthesis* for aesthetics, connoting sensory affect and concluding a work of art needed to produce vivid experience in viewers (Csikszentmihalyi & Robinson, 1990, p. 6). Dewey (1934) proposed that art is experience with a heightened state of consciousness.

Beardsley (1982) later established five criteria to constitute the aesthetic experience: (a) focus on an object, (b) a detached feeling and sense of freedom, (c) a remote affect moving a viewer to reflection, (d) heightened curiosity or powers of discovery, and (e) integration of self-acceptance and self-expansion (Csikszentmihalyi & Robinson, 1990, p. 8). Before the 20th century, scholars viewed aesthetics philosophically, socioculturally, and psychologically. Today, scholars are studying the aesthetic experience scientifically in the field of neuroaesthetics (Ione & Tyler, 2004; Ramachandran & Hirstein, 1999; Redies, 2015; Seeley, 2006; Starr, 2013; Vessel et al., 2012; Zeki, 2001, 2013) and bioaesthetics (Davis, 2012; Dutton, 2009). In the 21st century, some aesthetes hold the aesthetic experience is a biological instinct desiring to reproduce beauty and pleasure, and that "the art instinct" caused human evolution

(Chaplin, 2005; Dissanayake, 2000; Dutton, 2009). Other culturati maintain art in this century is a sociocultural issue available to those in possession of enough "contextual cultural capital" to interpret the "cult value" of art (Lopez-Sintas, Garica-Alvarez, & Perez-Rubiales, 2012, p. 338).

Theorists dedicated to the denial of the aesthetic experience include Goodman (1990), Danto (2005), and Dickie (1965), whose perspectives were that the aesthetic experience was phantom. Carroll (2002) countered these negations of the aesthetic experience: "How else would we classify sitting in a concert hall for an hour, attempting to follow the formal development of a symphony, if not as an aesthetic experience?" (p. 148). Some philosophical and psychological theorists who maintained that the value of the aesthetic experience in an affective or axiomatic approach and as interactivity between them were included in this present study. Some art can be appreciated but not found to be transcendent. This study is a preview of the phenomenological dimension of the aesthetic experience as relief, release, uplift, or transcendental.

The definitional arguments as to whether aesthetic experience is effective-affective, extrinsic-intrinsic, prima facia-a priori, cognitive-sensory, significant-nominal, or objective-subjective are endlessly debated. The debates have merit because the arguers seek to discover or extend the value of the experience. The question is whether the value is in the reward contemplation provides, in the pleasure experienced, or in the fulfillment of a human need to express and to connect. The aesthetic experience may be a combination of Dewey (1934), Kandansky (1977), and Shusterman (2010)—a "vibration in the soul" beyond nature (Kandinsky, 1977, p. 25). Greene (2001) described the

aesthetic experience as a process of being so present that it encompasses attentional focus, imagination, and a process of "appreciative, reflective, cultural, participatory engagements with the arts" (p.6) so that there is a "transcendence through a kind of flight" (p. 60).

All of the above aesthetes would agree that the aesthetic experience is a human phenomenon. Studying the human phenomenon becomes an "exhaustion of its motive concepts" (Langer, 1957, p. 9) but perhaps in seeing "purpose, is to understand it" (p. 9). One purpose continually examined is that of happiness and the efforts to be happy. In specifically studying the concept of happiness, Csikszentmihalyi (1975) devised the distinct concept of flow that 15 years later led him to study aesthetics. In 1990, Csiksentmihalyi and Robinson researched the conceptual model of aesthetic experience in relation to flow and found them synonymous (I discuss this more fully later in this chapter).

To advance knowledge, according to Langer (1979), "we must get us a whole world of new questions" (p. 13). This leads to new questions about the future of aesthetics in the age of technology. What are the reciprocal effects of aesthetics on technology and technology on aesthetics? Most recently, with the 21st century developments of technology, scholars applied flow to aesthetic experience in computer-mediated environments (Chang et al., 2014; Finneran & Zhang, 2005). Their findings were informative; however, because of the technology used, the findings were also limiting. To become "architects of ideas and practices" and to break these limits, "these

practical predicaments," (Jorgensen, 2014, p. 13), new questions must be asked for a firm understanding of the foundation of flow as aesthetic experience.

Primary Theorists and the Origins of Flow

In researching happiness later in the 20th century, Csikszentmihalyi (1975, 1990) derived the flow concept and that happiness occurred through experiences. The findings of the flow theory mirrored the established elements of Beardsley's aesthetics (Table 1), although Beardsley's (1982) and Csikszentmihalyi's research were independent of one another.

Table 1

Comparison between Flow Definition and Aesthetic Experience Definition

Flow	Aesthetic experience
Full concentration on the task at hand	Intense involvement of attention in response to a visual stimulus
Motivated intrinsically	Autotelic involvement for no other reason than to sustain the interaction
The activity is intrinsically rewarding and satisfying	Intense enjoyment
Lose of self-consciousness	A sense of human connectedness

Csikszentmihalyi (1975) purported a psychological approach and Beardsley (1982) a philosophical approach to enjoyment experienced by humans. Both Csikszentmihalyi and Beardsley (1975) investigated aesthetics as an intrinsic response rather than extrinsic agreement. In both contexts, "the aesthetic and flow experiences are in reality indistinguishable from one another" (Csikszentmihalyi & Robinson, 1990, p. 9).

Beardsley's five criteria of the aesthetic experience are summarized as freedom, harmony, detachment or reflection, discovery and exhilaration, and a sense of wholeness producing self-acceptance and self-expression. The two definitions and differences highlight delineations of the aesthetic experience but are hardly exhaustive. Philosophers, psychologists, sociologists, neurologists, and humanities scholars continue to add their views on perceptions and explanations of the aesthetic experience. Art is personal, active, provocative and relational (Simon, 2010) and all part of the human condition that needs to be further researched to be more fully understood.

Csikszentmihalyi (1975) originated the flow experience from hundreds of interviews with persons who reported deep involvement in games, sporting, and artistic activities with few external rewards. They also reported immense enjoyment and reported that the activities became their own reward (Csikszentmihalyi & Robinson, 1990). This deep involvement was referred to as an autotelic experience, and, in relation to the arts, Csikszentmihalyi and Robinson (1990) referred to the heightened state of consciousness as the aesthetic experience. They concluded that the most celebrated form of the aesthetic experience includes a transcendence to a loss of ego and attentional focus to the loss of time and self-consciousness. Csikszemtmihalyi (1990) described eight major components for the flow experience: "tasks, concentration, clear goals, immediate feedback, effortless involvement, a sense of self-control, self disappears, and loss of time" (p. 49). He viewed the sense of transcending everyday realities for a gain in deep cognitive and emotional involvement that provided a "more ordered and intense world" (p. 114).

Flow Theory as Aesthetic Experience

As the flow theory was applied to many practical experiences and studies, late in the 20th century Csikszentmihalyi and Robinson (1990) transferred Csikszentmihalyi's (1975) concept of flow to exploring the aesthetic experience in a published work. The research supported that similarities existed between flow and aesthetic experiences. For the purposes of the present study, I used Csikszentmihalyi's definition of flow, which is composed of eight elements: clear goal; slight imbalance of challenge and skills; combining action and awareness; concentration on a task; loss of time and ego; transcendence; awareness and control of actions; and autotelic action (p. 49). The definition stresses transcendence, a state in which one loses oneself fully to become more fully oneself. The present study held that the aesthetic experience is both autotelic and astonishing (i.e., for its own sake and for an awakening, usually enjoyable experience). Csikszentmihalyi and Robinson's four dimensions of an aesthetic experience of perception, intellect, emotion, and communication (relating to the art and artist) were the underlying constructs for both the questionnaire and the app.

Four Dimensions of Aesthetic Experience

For this research, the definition of aesthetic experience used by Csikszentmihalyi and Robinson (1990) fit well as a conceptual framework and guided this study. Csikszentmihalyi and Robinson looked at the nature and mechanics of aesthetic experience and found it to be cognitive, perceptual, and emotional, with transcendental perspectives. Elaborating on these four elements would mean that an aesthetic experience must involve a form of understanding, sensory pleasure, emotional harmony, and

transcendence of actuality. (In viewing contemporary art, one might adjust the definition to include a form of identification, sensory response, emotional response or reaction, and descendence of actuality. In contemporary art, such descendence would be equivalent to the tragically sad experiences felt during Mozart's *Requiem Mass in D Minor,* or Shakespeare's *Oedipus Rex,* or the powerfully frightening view of an oncoming tornado.)

Csikszentmihalyi and Robinson (1990) held that the basic skills needed for an aesthetic experience include "emotional sensitivity, visual training, knowledge of art, history and culture, and empathy for what artists communicate—these are the basic skills that experts use to decode the information embedded in works of art" (p. 91) and primarily that "feelings and visual skills are necessary for the aesthetic experience to occur" (p. 92). They claimed the aesthetic experience is an aesthetic interaction and "occurs when information coming from the artwork interacts with information already stored in the viewer's mind" (p. 18). The aesthetic experience is an accumulating visual literacy process that transforms the interaction between the art and the viewer. In educational terms, the aesthetic experience would be considered constructivism.

Cognition in Aesthetic Experience

Csikszentmihalyi's (1975) flow theory requires some cognition in the form of intense curiosity and intrinsic interest. Then the perceiver's cognitive processing dynamics and processing fluency in art appreciation lends itself to aesthetic pleasure (Reber, Schwarz, & Winkielman, 2004). Knowing a process for appreciating art contributes to viewers' aesthetic experiences. For the novice viewer, the aesthetic

experience process “involves the integration of sensory and emotional reactions in a manner linked with…personal relevance” (Vessel et al., 2012, para.1).

Csikszentmihalyi (1975) insisted there must be a set goal and a task as the two necessary actions ascribing flow and the aesthetic experience. Those two cognitive requisites seemed reasonable for the museum professionals with whom Csikszentmihalyi and Robinson (1990) conducted their research and also with novice viewers who have not learned the skill or a process for seeing art. Csikszentmihalyi and Robinson assumed that the novice viewer wants the “satisfaction of a generalized human need for knowledge and understanding that the arts provide” (p. 12) and that perhaps the novice viewer is unaware that “art is pleasurable because a great amount of knowledge about the world is encapsulated in the transaction” (p. 12). Museum professionals, artists, and persons educated in liberal arts recognized the aesthetic experience as a “cognitive rush” (p. 12), whereas novice viewers believed the aesthetic experience to be a code to crack, were curious about the experience, and set a goal to attain it.

Goal setting is important for the flow experience because it helps one focus, concentrate, and recalibrate when necessary. Recalibrating goals or means to goals is important because the feedback from self and others improves the chance of success. In appreciating art, a goal or intention the viewer needs to set is the goal of understanding the relationship and communication between the artist and viewer. Thus, the optimal, cognitive goal can be for “viewers to encounter works of art with interest, confidence and the anticipation of a positive and enjoyable experience” (Csikszentmihalyi & Robinson, 1990, p. 141).

Within the visual arts, cognition reflects coding into an object and decoding by the viewer; it is not purely cognitive. Symbolic coding "is to offer the beholder a way of conceiving emotion" (Langer, 1953, p. 394). Redies (2015) held that two forms of coding exist: "sensory coding and cognitive coding" and "are defined as the translation of external information into neural activity and they are a prerequisite for further information processing in the brain" (para. 21). Coding and decoding of a statement, a perspective, a judgment, also comprises "showing us the appearance of feeling, in a perceptible symbolic projection" (Langer, 1953, p. 394).

Aesthetics includes the object, the statement, and the expressive form. Overlaying an abbreviated version of the architectural aphorisms of Sullivan's (1896) form follows function and Wright's (1908, as cited in Wright, 1992) form and function are one, the function in both architecture and art transcend intellectually and emotionally. That transcendence is Smith's (1989) concept of the enlightened beholder. Such transcendence is both intellectual and emotional and involves cognitive associations that build understanding and emotional responsiveness that, in turn, build empathy, a visceral understanding, and shared identity that unites humanity. As in literature, art and its symbolization are all for one purpose: "To be a part, that is fulfillment for us: to be integrated with our solitude into a state that can be shared" (Rilke, 2006, p. 31). To integrate with solitude may be another definition of the aesthetic experience or another goal to set in the aesthetic experience process.

The process of aesthetically encoding and decoding is a thrilling cognitive and affective rush generating perspectives and expressions of reality (Alexander, 2003;

Csikszentmihalyi & Robinson, 1990; Emanuel & Challons-Lipton, 2013; Langer, 1979; Seidel, Tishman, Winner, Hetland, & Palmer, 2009). Certain visual configurations produce a responsive experience in the nervous system that generates an encoder output (art) and stimulates a decoder input (meaning and experience). Cognitive coding is germane to content processing and contextual (cultural) processing, and sensory coding can be perceptual and contextual processing (Palmer, Schloss, & Sammartino, 2014; Reber et al., 2004; Redies, 2007). On both ends of the stimulus-response coding activities is a desire to produce a pleasant or unpleasant dimension and recreate an experience. Challenges exist in transmitting a message and producing a visual object, and certain critical thinking skills support the observer in understanding the message or meaning inherent in the visual form. The most predominant critical and creative thinking skill employed is making associations (Jakesch & Leder, 2009). This cognitive, associative process makes metaphors and symbols in art possible and makes meaning possible for the viewer (Langer, 1979). The close interplay between sensory and perceptual processing leads to aesthetic emotions and aesthetic judgment and helps a viewer intuit meaning.

Art provides an ideal opportunity for advanced cognitive processing: resolving ambiguity in art as a problem-solving task that affects insight and appreciation (Muth, Hesslinger, & Carbon, 2015). The cognitive component enriches the experience when the challenge and the skill level are in balance (Finneran & Zhang, 2005). If the challenge exceeds the skill level, anxiety usually results, and if the skill level exceeds the challenge, boredom results. The cognitive goal is best if the task is only slightly higher than the skill level; otherwise the task is cognitively taxing and has an influence on the likelihood of

flow. When the task is to understand and have a connection to art, and the viewer has had little training, the viewer is ambiguous about the challenge. When balance exists between the challenge and skills, viewers can be fully attentive and focused (Csikszentmihalyi & Robinson, 1990), and then viewers give up their most human attribute: self-consciousness. When this moment of detachment occurs, transcendence is possible.

The cognitive process of concentration of attention is a pathway to the transcending aesthetic experience. However, the goal component requires definitional clarity and is supported by perception skills and affective responses. The detachment or "disinterestedness…is not meant to preclude emotional involvement, but rather promotes a receptiveness, where the pause in action allows the experience to play with our emotions, sensorimotor resonance and potentially with our memories and imagination" (Brincker, 2015, p. 21). The process is similar to the axiom that nature abhors a vacuum. Through the emotional detachment, a void is created for a flood of new emotional engagement: transcendence.

Perception and Affective Response in Aesthetics

The perception dimension is often related to formalism in art: form, color, line, shapes, textures, space, movement, and message. While this type of perception is the result of training what to see and holds a prominent place is art appreciation, more factors are involved. The condition of focusing to see the art and its meaning can be the result of feeling fully present. Perception can also be the result of intuition and even "global sensing" (Csikszentmyhalyi & Robinson, 1990, p. 29). Perception relates to different ways of knowing and "you only see what you are taught to see" (p. 42), which is a type

of perceptual blindness, similar to the placebo phenomenon. Perception, like any vantage point, is a cultural issue. There is a reciprocal exchange between culture and art: it is a dance of informing and contributing to each other (Vakeva, 2007). Understanding other cultures through art does not necessarily mean that the art will replace cultural values (Greene, 1995). Rather, understanding other cultures through art becomes enlightened perception and perhaps empathy, which is "the capacity to see through another's eyes, to grasp the world as it looks and sounds and feels from the vantage point of another" (Greene, 1995a, p. 102).

Dewey (1934) weighed in on the concept of perception. Experience, according to Dewey, is both central to individual growth and the medium of education. People gain experience when they attend to aspects of the world they care about by slowing down perception and making dominant the quest for experience. To slow down perception, persons become more aware of sensory intake. As reported by Hsieh (2011), action and consequences are connected by the senses, intrapersonal sensations, and these generate the aesthetic aspects of an experience. Hsieh credited Dewey with conceptualizing that experience and even everyday experiences (Irvin, 2008) can have an aesthetic character. Hsieh summarized: "If people pay heed to the aesthetic aspect of everyday experiences…their lives seem to be more satisfying, beautiful and even more profound" (p. 203). For an example of transcendence beyond the mundane, Picasso assembled two ordinary, discarded bicycle handles and a seat to create a metallic bull with the intent that viewers see with exhilaration both the factual and the suggestive (Figure 2).

Figure 2. Pablo Picasso, *Bull's Head,* 1942*,* Collection Mesée Picasso, Paris.

In slowing down perception, viewers develop both critical and creative thinking that contributes something more than viewing another piece of art. Looking to know and feel, or sense-data, becomes seeing with perception. Dewey (1934) encouraged (a) active learning of seeing, (b) talking about the qualities of art, (c) understanding the historical and cultural context in which art is created, and (d) questioning the aesthetics and justification of the value and function of art. Dewey's process of aesthetic analysis would be considered the total human experience had he included emotions. Dewey elaborated on sensory aspects in relation to psychology and emotions in support of reasoning in a balanced person, the operative nuances being "supportive of reasoning" and "balanced" (p. 247).

According to Csikszentmihalyi and Robinson (1990), one function of the aesthetic experience is emotional harmony when "humanity is communicating with humanity" (p. 132) in an aesthetic encounter. As psychologists, they recognized that art and the aesthetic experience could be a means of sublimating feelings and desires in a socially acceptable form. Regarding the affective dimension, they reasonably held that "the quality of the emotional response may vary depending on the amount of time spent with

the work" (p. 40) and emotional responses because of preferences or biases in relation to color, style, subject matter, etc.

Reber et al. (2004) adopted an interactionistic perspective suggesting "that a sense of beauty emerges from patterns in the way people and objects relate" and these responses are the "processing experiences of the perceiver that emerge from the interaction of stimulus properties and perceivers' cognitive and affective processes" (p. 365). This interaction is a subjective perspective and raises the question of whether art can be viewed objectively without a myriad of experiences and associations colliding in exciting discovery. The process of viewing and relating to experiences is individuated.

The emotional dimension is discussed from the viewer's vantage point. Langer's (1953) visual literacy expounded on an emotive process and the means of attaining "exhilaration and tense excitement" and "aesthetic pleasure" (p. 259) for the "pursuit of happiness" (p. 289). Langer (1979) defined aesthetics as symbol using and symbol reading while stressing human response and human understanding. Langer (1953) emphasized responsive emotions that transport concepts and emotions, deeply valued emotions, and considered art as significant form that transports meaning. From Langer's (1953) perspective of human response, human emotions especially are presented in every aspect of artists' choices. The form, genre, or key in which an artistic expression is made is not only an emotional choice but also an emotional expression.

Langer (1953) viewed aesthetics as symbolic formulation and meaning. With emotionally impacted symbols, humans create art. With symbolic insignias, humans declare war, exclude some portions of humanity because of their skin color, create

immense university athletic rivalry, or promote national patriotism. Art provides the opportunity to relive emotional experiences. Langer's (1953) theory is grounded in phenomenology, biology, and psychology. Langer reasoned that aesthetics is "a thoroughly bodily affair, which is fundamentally rooted in sense perception….evolved from animal sense-stimuli-instinct to human sense-perception" (p. 48) and held that symbols in art hold significance for the viewer, as they present conceptual shorthand for an idea and provide a gateway to affective responses.

Transcendence in Aesthetics

In the praxis of transcendence as a goal, Greene's (1978) view, "Transcendence has to be chosen; it can be neither given nor imposed" (p. 2), and transcendence deserves respect and needs to be grounded in the landscapes of personal experience (Dewey, 1934). Transcendence occurs with the loss of ego and time; at the same time transcendence is experienced by a person in the context of a task and artifact used (Finneran & Zhang, 2002). Transposing Rilke's (2006) sentiment, transcendence is "to be integrated with our solitude into a state that can be shared" and "flooded with the most intimate Yes" (p. 31). It is saying yes to an action or reaction. Transcendence occurs in the doing, be it games, sports, or research. It will not occur without an action. The action can be an activity such as running, reading, dancing, or sitting actively or passively researching the Web. Specifically, the aesthetic pleasure is grounded in the processing experience and "is a function of the perceiver's processing dynamics" (Reber et al., 2004, p. 365). Transcendence can be an interaction such as people on computers and handheld devices (Chang et al, 2014; Finneran & Zhang, 2005). The term *telepresence* was coined

for the perception available when using computer technology and is defined as "the extent to which one feels present in the mediated environments, rather than in the immediate physical environment" (Steuer, 1992, p. 76). Telepresence can be considered a type of transcendence.

Viewer, Artifact, App, and Task Model of Flow

The flow phenomenon is possible with three components: a person, an artifact, and a task (Finneran & Zhang, 2005). However, in this study a fourth component was added: the art app. The artifact, the smartphone as hardware, is of limited service if it does not have access to the appropriate app, the software. Using the app is the actual component. In this study, the app on art was essential because it helped participants explore in general historical knowledge available about art, utilize critical thinking skills, and identify emotions. Csikszentmyhalyi and Robinson (1990) used the term "informed experience" (p. 152) to see well and develop understanding.

The cognitive, exploratory possibilities that technology and an app can provide about art are: knowledge about media, technologies, and skills; analyzing organizational structures and form; evaluating subject matter, symbols, and ideas; interpreting history and culture in art; assessing the characteristics and merits of works; and connecting visual arts and other disciplines. All of this pedagogy is an interplay between learning and the tools for learning (Gardenfors & Johansson, 2005; Xu, 2011) and has been confirmed that it can occur in computer-mediated environments (Chang et al., 2014; Finneran & Zhang, 2002, 2005). The possible emotive movement of the transcending aesthetic experience with a smaller screen was the objective of this study.

Preconditions and Context for Aesthetic Experiences

According to Finneran and Zhang (2005), flow is modeled around three factors: flow antecedents, flow experience, and flow consequences. The antecedents to flow include, "clear goals, immediate feedback, potential control, and merger of action and awareness" (p. 1048). Flow experience expresses itself in "concentration, telepresence, time distortion, and loss of self-consciousness" (p. 1048). Flow consequences encompass "positive affect and autotelic experience" (p. 1048) to which can be added memorable exhilaration or revulsion; the latter can be the affective and desired response with some contemporary art. For the most part, people do not forget their aesthetic experience; they know the art that induced it and its location. The consequences are often described as delight, intense pleasure, rapture, a meaning that grows and swells (Greene, 2001).

Aesthetic experiences have some contextual requisites. For example, the longer a viewer looks at a painting, the more likely the aesthetic experience (Locher, 2011). According to Jakesch and Leder (2009), an aesthetic experience occurs under certain conditions of "incomplete cognitive orientation that exaggerates tension that is then relieved when meaning surfaces" (p. 2106). The sensual and emotional ambiguity generates a sense of arousal or dissonant that leads to coherent information. The requisite of ambiguity is appreciated by the viewer and relieved with the number of association made by viewers (Martindale, 1984). Csikszentmihalyi and Robinson (1990) held that setting a goal is a precondition or requisite for the aesthetic experience. Goal setting occurs with ambiguity between challenge and skills; that is, when the challenge is slightly higher than the skill set to attain the goal (Nakamura & Csikszentmihalyi, 2002). This

psychological event can be referred to as a challenge, ambiguity, or chaos. Challenge or ambiguity is a necessary requisite because it provides the tension that generates motivation.

Some believe the *paratext*, the information placed next to the art and statements presented regarding artworks, also become a precondition for the aesthetic experience particularly when associated with abstract paintings (Belke, Leder, & Augustin, 2006; Jakesch & Leder, 2009; Leder et al., 2005). Belke, Leder, Harsanyi, and Carbon (2010) held that an artist's name in the paratext that has recognizable, special status (e.g., Picasso) adds to facilitating art perception and appreciation. However, it is pedagogically better if it does not contain an interpretation of the art because that becomes top-down learning about art rather than experiencing art.

While paratext near the art can contribute to a flow experience, Christensen (2011) found that technologies have strengthened viewer participation, and the formation of significance and meaning of art if viewers can generate a curiosity to click on a hyperlink or search a website for additional information while in situ and online. Viewers use the paratext as contextual cues for further researching. Initially, this human-computer interactivity of researching online seems far too passive to be a condition for the aesthetic experience excepting when the paratext inspires or leads to research that assists with setting a goal for understanding meaning in art. Another type of involvement of art and technology was recognized as telepresence (Steuer, 2011), which is a transcendence when people are so engaged in the vividness and interactivity of the technology, as in Web surfing, that they mentally and emotionally transcend (Carr, 2012; Finneran &

Zhang, 2005; Hermann, 1973; Ibanez, Di Serio, Villaran, & Kloos, 2014). Technology affords telepresence that stimulates senses and elicits participation that generates attentional-focus on the artwork.

Body positioning and bodily movement while looking at art have been studied and found to contribute to mediating thinking and perception in viewing art (Steier, Pierroux, & Krange, 2015). Kinetic technologies of touch-based interfaces (touch screen) contribute to engagement with art (Czajkowski, 2011; Pierroux & Ludvigsen, 2013). Locher (2011) reported on the complex interaction of the aesthetic experience and visual arts. Locher concluded after studying posture and the duration of time spent in front of an artwork that individuals stayed three times longer in front of works when using an audio tour. Locher drew this conclusion because the viewers' focus stayed on the artwork rather than diverting their attention to reading a label. Csikszentmihalyi and Robinson (1990) would term this *attentional-focus* with a myriad of perceptual and attentional benefits.

Desire for meaning is a precondition or prerequisite to the aesthetic experience. Aesthetic education is a resistance to meaninglessness (Greene, 1995a) and is the "intentional undertaking designed to nurture appreciative, reflective, cultural, participatory engagements" in art and life (Greene, 2001, p. 6.) Outside of literary studies, instruction on the features and dynamics of the aesthetic experience and how to attain it is diminishing in the educational system. The prevailing practice is to train as a byproduct critical and creative thinking, the coding of metaphors, and symbol-making. Cultural transcoding is a stepchild. While everyone from Australian aborigines to New

York art critics respond differently to art and symbols (Csikszentmihalyi & Robinson, 1990), most people want to discover meaning and the significance in their lives whether it be decoding the various possible meanings of an embodied gesture of a wink or the enigmatic smile of the *Mona Lisa*.

Applied and Articulated Research on Aesthetic Experience

To operationalize and delineate the flow theory, researchers have applied the flow theory in various context of schools (Admiraal et al., 2011; Bakker, 2003), sports (Bakker, Oerlelmans, Demerouti, Slot, & Ali, 2011; Dillon & Tait, 2000; Jackson & Marsh, 1996; Mugford, 2006; Rogatko, 2009; Schuler & Brunner, 2009); games (Fang et al., 2012; Liu & Chang, 2012); music (Bakker, 2003; O'Neill, 1999); nursing (Ahern, 2005; Wardini et al., 2013); business (Koufaris, 2002; Nielsen & Cleal, 2010; Thaler & Tucker, 2012), and cyberbehavior (Eber, Betz, & Little, 2003; Gee, 2003; Liu, Liaao, & Pratt, 2009; Novak, Hoffman, & Yung, 2000). To further delineate flow, researchers developed instruments for measuring flow: experience sampling method ([ESM], Csikszentmihaly & Larson, 1987; Hektner, Schmidt, & Csikszentmihalyi, 2006), which seeks momentary signals of the flow state during random sampling. ESM relies on participants' memories of subjective feelings. Jackson and Eklund (2002) developed the Flow State Scale 2 (FSS-2) to measure the frequency of flow in intervals, which timing may disrupt. However, both require a computational approach to standardized scales that contributes to validity and reliability (Moneta, 2012).

Literature Review Related to Variables and Flow Theory

Csikszentmihalyi and Robinson (1990) provided significant insights into the aesthetic experience in the 20th century. Discovering 21st century thinking on aesthetics, especially in relation to technology as discussed in recent academic articles is important. I more fully discuss recent studies on aesthetics and technology in the sections that follow. Studies related to these variables include the work of researchers who explored technology in various academic disciplines. I also review research about how technology is advancing educational effectiveness and providing flow opportunities. Later, I review studies applying flow and technology to art.

The Aesthetic Experience

The key to understanding aesthetic experience is deciphering sense data. Herrmann (1973) wrote, "[art] stimulates(s) our senses and elicit(s) our direct participation before we begin to theorize about them…" (p. 102). Research on the aesthetic experience indicated the aesthetic experience is more often occurring in the presence of art when a longer time is spent viewing a painting because this indicates "greater involvement of cognitive mastering and evaluation processes" (Flexas, Rossello, de Miguel, Nadal, & Munar, 2014, p. 1; Lopez-Sintas et al., 2012). Langer (1957) viewed experiences as more emotive and sensory than cognitive, but either path can lead to the aesthetic experience.

If the visual literacy skill level is untutored or minimal, boredom predictably will ensue (Engeser & Rheinberg, 2008; Pilke, 2004) rather than the aesthetic experience. However, if viewers are able to decipher embedded symbolic codes through making

associations and reading sense data, then the aesthetic experience is possible (Morris, Urbanski, & Fuller, 2005). If the participant becomes so motivated and intrigued with the art, flow is likely to occur (Pilke, 2004). In the digital aesthetic experience, a strong connection exists between the explicit environment of the device and the app and the implicit visual literacy process used to view and respond or react. This response or reaction can be physical and proprioceptic or cognitive and affective, willfully sought, or accidentally and spontaneously occurring. Complexities exist in measuring the aesthetic experience. The aesthetic experience must be considered one with other human considerations that can influence the outcome, such as lack of sleep, concerns, and other psychological baggage (Fenner, 2003). However, if the aesthetic experience has been self-reported, researchers can measure the intensity of the aesthetic experience using the ESM (Csikszentmihaly & Larson, 1987; Hektner, Schmidt, & Csikszentmihlyi, 2006) and Flow State Scale-2 (FSS-2) (Jackson, Martin, & Eklund, 2008).

Aesthetic Experience and Mobile Devices

Evidence exists for people's total immersion in mobile devices (Dickey, 2015; Jennett, 2010; Russell & Newton, 2008). People, especially children, are engaged in their iPad and cell phone games (Carr, 2012; Chen, 2008; Iqbal, 2012; Jennett, 2010; Russell & Newton, 2008). The zoom or high-resolution feature of computerized devices contributes to tantalizing viewers; for instance, the zoom feature facilitated researchers discovering initials in the Mona Lisa's eyes (Pisa, 2012). Researchers are studying the use of mobile devices to see how people engage with the devices and engage or disengage with others.

Palmer et al. (2014) researched pedagogical framework and mLearning and concluded that the constructivist approach helped students reconstruct information and integrate it more effectively using mobile technologies. Palmer et al. included five processes (perception, implicit classification, explicit classification, interpreting, evaluation) for attaining the aesthetic experience (i.e. process-based learning) and stressed personal preference (i.e., bottom-up learning). While tools for learning have changed within the past years, teaching and learning methods have not. Further research is needed to determine the best pedagogical frameworks when learning is delivered using mobile devices (Ozdamli, 2011)

Chang et al.'s (2014) quantitative study in art appreciation with technology evaluated the potential of augmented reality (AR) to enhance art appreciation in an art museum. The study used a pretest and posttest with an AR-guided group, an audioguided group, and a nonguided group. The nonguided group received no art appreciation instruction. The audioguided group received audio instructions that guided them through the museum and explained what was meaningful in each painting. This group analyzed nothing on their own. The AR-guided group used an iPad (equipped with AR software) that gave participants the ability to zoom in and out on virtual images of artworks while simultaneously viewing the art in person. The results of the study found that "the application of the AR-guided mode in the painting [art] appreciation activity is beneficial for learning performance" and concluded, "it should not be ignored in art museums in the future" (Chang et al., 2014, p. 195). The results also indicated that the learning experience, as quantified by the difference between the pretest and posttest scores, was

more effective with the AR group using the zooming features on the device than the control group. No significant difference was found in posttest scores between the nonguided and audioguided groups; however, scores for the AR-guided group were significantly better than for both the nonguided and audioguided groups. Another interesting outcome was the suggestion that the iPad used in the AR-guided group was too heavy and bulky, and mobile phone devices were recommended.

A shortcoming of the Chang et al. (2014) study is that it used a top-down teaching approach, an approach that sustains the practice of telling as teaching that usually consists of factual information requiring participants to memorize facts. Top-down teaching does not elicit participants' wealth of knowledge and experience that they bring with them as they stand before a painting; thus, participants' learning is limited because no one forms a perception relevant to the artworks they are viewing. Chang et al. provided the participants with an interpretation of what was considered important and relevant in each artwork, as opposed to providing a process of art appreciation to be used by participants any time they view artworks. Further, the questionnaire at the end consisted of multiple-choice questions that asked viewers to confirm what color was used in a painting and which painting from a list was not in the exhibit (Chang et al., 2014). Only two samples from the questionnaire were provided, and they were objective, multiple-choice questions relating to whether a specific color and subject were in a painting. The mLearning potential was diluted because participants were encouraged to explore the paintings with the zoom feature, but then were expected only to know the given facts from the audio-instructions and from what they garnered from AR. The participants were not encouraged

to think for themselves or to build on the knowledge in the audio guides, but were encouraged to explore the art with the AR feature on their iPad.

Another puzzling issue in the Chang et al. (2014) study was the omission of referencing Csikszentmihalyi, the eminent scholar of the flow theory. In a Heisenberg effect and Droste manner, the Chang et al. (2014) article only referenced flow in relation to Webster et al. (1993), who referenced Csikszentmihalyi. However, Chang et al. provided an adequate definition of flow and used that as their guidelines in the research of promoting and encompassing "…a subjective psychological state of control, attention focus, curiosity, and intrinsic interest in users" (p. 186). They did not address loss of ego awareness or loss of time awareness. While the Chang et al. study used several methods to measure participants' aesthetic experience and behavioral responses in relation to AR, because their pedagogical framework contrasts with my constructivist approach, their relevance to my research was only in mLearning.

Flow and Computer-Mediated Environments

The research by Finneran and Zhang (2002) provided insight into the application of flow as a psychological state to computer-mediated environments (CME) and human computer interaction (HCI). Flow as the optimal experience in absorption or immersion with personal computers (desktop PCs) is the focus in their study. Finneran and Zhang scanned numerous related studies on the subjects of flow in relation to HCI during the 1990s that informed their study and prevented repeating similar academic efforts (Chen 2000; Ghani, 1995; Trevino & Webster, 1992; Webster et al., 1993).

Finneran and Zhang (2002) recognized the complexity of the artifact, the computer itself, was a third component to the user and the user's behavior. They concluded that studies indicated, "flow can lead to increased learning, improved attitudes, and positive experiences within a computer-mediated environment" (p. 1053). The information technology was separate from the task and separate from the user. They confirmed, "It is the task and the context that create the flow experience, not merely the Web site type" (p. 1050) or technology. They verified that "flow is experienced by a person, in the context of the task and the artifact used" (p. 1052).

The phenomenon Finneran and Zhang (2002) did not detail was not going further to understand the mindset that occurs with the technology. All artifacts are an extension of the human. For example, a shovel is an extension of the hand; a car is an extension of the feet. The computer is an extension of the mind. What had not occurred to Finneran and Zhang were the different types of mental expectations and functions that occur when a person is in situ with a desktop, laptop, iPad, iPod, and mobile device. The expectations and behavior vary with each one. Some of those innovations had not been invented at the time they conducted their study, so the variance could not be measured. The invention spiral had not taken its innovative turn into small screen smartphones at the time of Finneran and Zhang's research. Today, a different cutting-edge technology exists in which to apply and study flow.

Ibanez et al. (2014) researched whether AR might promote learner's flow state and whether AR helps attain higher learning outcomes. The scope of the study was limited to the topic of the invisible forces of electromagnetism and was selected because

the topic of electromagnetism is abstract and cognitively demanding. The research questions focused on (a) whether AR developed deeper understanding compared to students using web-based lessons and (b) if AR lessons promoted higher student flow experience than those with web-based lessons. They used two differing media because the students would benefit from the explanatory words in studying the invisible factors of electromagnetism, but web-based lessons and AR lessons provided visual assets that promoted and enhanced learning. AR also afforded tactile and visual interactions because AR provided digital information and real environments. Web-based lessons are a static presentation; AR can be interactive and more exploratory with 3-D manipulation, and with zoom-in capacity or going live to the site, such as a museum or a science experiment that has webcams and earthcams for real-time camera viewing. However, there are considerations. Cheng and Tsai (2012) and Ibanez et al. (2014) supported making the distinction between "AR as a concept rather than a technology" (Wu et al., 2013, p. 43) and AR needs special integration into informal or grade-appropriate learning settings.

A main strength of the Ibanez et al. (2014) study is that it affords educators the distinction of knowing the differences and virtues of both AR and web-based lessons. Both provide technical resources, but web-based lessons' resources have limited interactivity, whereas AR affords 3D manipulation of shapes. The research supported that "AR-based application contributed to increased academic achievement and promoted positive emotional experiences compared to traditional teaching in STEM fields (science, technology, engineering, and mathematics)" (Ibanez et al., 2014, p. 12). More research could be made using a wider age range of students than high school students. Further,

Ibanez et al. did not account for the possibility of the handheld device becoming a novelty, removing some of the necessary focus for learning, and there was no long-term evaluation for retention of material. Nonetheless, Ibanez et al. provided positive evidence that AR can advance the flow experience. They reviewed the flow experience using a science topic, but their research indicated that participants did not experience flow if the tasks were too easy or too difficult. They recommended a careful balance among extraneous cognitive load, overly advanced AR support, and task difficulty.

Hawkes and Hategekimana (2010) studied students in four college-level courses and determined that no negative effect was present when students used wireless, mobile computing tools. The course assessment data of three courses in English, business, and history showed no difference in test scores among students using ubiquitous technology and those not using technology. Therefore, Hawkes and Hategekimana concluded that there was "no compelling evidence to support the literature, suggesting the use of wireless mobile computing negatively impacts student performance" (p. 70). In a math course, the statistical outcome indicated a significantly positive difference in scores, verifying that mobile technology "supports independent, authentic, and complex learning outcomes" (p. 71).

Flow has been studied in a naturalistic context (Chang et al., 2014; Chen, 2000; Jackson & Csikszentmihalyi, 1999; Novak, Hoffman, & Duhachek, 2003; Sinnamon, Moran, & O'Connell, 2012), and study results have shown that various activities contribute to improved quality of life. In relation to CME, researchers found "that flow can yield in increased learning…and how to design effective human computer

interactions that are conducive to these optimal experiences (Finneran & Zhang, 2005, p. 98). Controversies exist because it is difficult to determine which of the eight flow elements of "tasks, concentration, clear goals, immediate feedback, effortless involvement, a sense of self-control, self disappears, and loss of time (Csikszentmihalyi, 1990, p. 49) contributes most to flow or interrupts the possibility. New information can "either create disorder in consciousness…or it will reinforce out goals, thereby freeing up psychic energy" (p. 39), to name only a few possible distractors to the optimal experience.

Technology and Immersion in Education

Di Serio, Ibanez, and Kloos (2013) researched AR in relation to a visual art course and found that among middle-school students, AR had a positive impact on their motivation. Di Serio et al. used the Instructional Materials Motivation Survey (IMMS, Keller, 2010) as a pretest and posttest, which they employed as their motivational measurement instrument. Di Serio et al. defined motivation as the "student's desire to engage in a learning environment" (p. 587). Di Serio et al. indicated that AR fostered immersion and interactivity maximizing motivation and engagement of students in a visual art course.

The strength of the Di Serio et al. (2013) study was in discovering that with AR, "students achieved higher levels of engagement with less cognitive effort" (p. 595). Another contribution to visual arts instruction was to discover that AR produced more and better learning results in the experimental group than did the slide-based arts course in the control group. The weakness of the study was that the visual art activity was

incidental as they were measuring only the teaching-learning influences. Perhaps the same research could be conducted on the same students with a math or science class or project and discover the same results that AR technology provides greater benefits to students.

Rationale for Implementing the Flow Theory

Human purpose in life is a quest for meaning. As humans search for meaning within their personal identities and validities, they look to their actions or tasks and their interior satisfaction or happiness quotient. Csikszentmihalyi (1975, 1990) studied the elements of happiness and derived his flow concept and later extended it to or equated it to the aesthetic experience (Csikszentmihalyi & Robinson, 1990). While theorists and researchers were in agreement with the findings, they asked under what context or environment is flow applicable or existent. As a result, numerous studies operationalized the theory and found it sound, though the conditions are arbitrary. Therefore, asking if flow is possible in computer-mediated environments and in cyberbehavior is intellectually evolutionary.

Studies Related to the Variables

Several studies relate to the dependent variable, the aesthetic experience (Chang, et al., 2014; Di Serio et al., 2013; Finneran & Zhang, 2002; Hawkes & Hategekimana, 2010; Ibanez et al., 2014), indicated that their results affirmed that the dependent variable of the aesthetic experience is possible within various technologies. However, the independent variable of the evolving, current devices of smart technology remains to be studied and will be researched further as technicians and educators observe the engaging

phenomenon of devices and apps (Dickey, 2015). An example is the predominant app, *Pokémon Go*, the all-engrossing, high-tech sports game immersing viewers myopically in augmented reality.

Summary and Conclusion

In this chapter, I reviewed the literature on empirical research on flow, aesthetic experience, and aesthetic education in relation to various disciplines and in relation to various computer-mediated environments. Csikszentmihalyi (1975) constructed the flow theory. Later, Csikszentmihalyi and Robinson (1990) applied flow to aesthetic experience and found parallel similarities in the metacognitive substance of transcendence. Finneran and Zhang (2005) studied the flow theory in relation to computer-mediated environments and found people did transcend when using computers. Chang et al.'s (2014) results supported those of Finneran and Zhang. Chang et al. found that viewers transcended when looking at art, while using AR to become more informed about particular art. Other researchers studied artistic virtual environments but did not use standardized mobile technology; rather, they used film, audios, videos, and desktop computers, to measure emotional involvement and telepresense.

Limited research exists on the effectiveness and potential of the use of the digitized small screen in relation to the aesthetic experience and virtual art education. The literature reviewed covered the most recent literature on flow in relation to the aesthetic experience and flow in relation to technology (Csikszentmihalyi & Robinson, 1990; Di Serio et al., 2013; Finneran & Zhang, 2005). Researchers found that the Web and some hand-held devices like the iPad have contributed to advancing knowledge in some areas

of education (Carr, 2012; Chang, et al., 2014). In the present study, I used a questionnaire to generate data on participants' response to viewing art via smart networks and to generate thoughts on the effectiveness of mobile technology as an environment for the aesthetic experience.

The potential contribution of this study is to develop a virtual model for aesthetic experience and to analyze how this development might enhance changes in an individual's enjoyment of art, aesthetic appreciation, cultural appreciation, and insights. The study results may promote positive social change by providing insight into ways of developing meaning in art and into ways of developing meaning in life. Participants may begin to analyze art with more insight about artistic techniques and standards. They may begin to analyze themselves, their community, and the world with more curiosity and compassion. The process of asking systemized questions and reflecting on the age and circumstances of art may become a thought habit extended to present situations, challenges, and opportunities for social changes. As Dewey (1934) held, art and the study of aesthetics become stabilizing predictors of human progress.

Participants may discover intrinsic changes if they experience flow. Through their elevated aesthetic experience, participants may begin to see the social significance and social impact of art. They may change their opinions about their ability to appreciate art; they may gain confidence about their own strategies in viewing works of art; they may experience transcendence, a heightened state of consciousness when they approach a work of art. If they learn a process, they may be able to apply perceptual-formal dimensions in viewing art wherever they go, and they may more fully identify their

emotional encounter and responses with art. They may change a social apperception and may generate new sensibility about people and events from other ages and places and in present day. Experiencing a process for transcendence by viewing art might ultimately generate more synergy, interaction, and innovation, create more positive regard for people, places, and things, and result in a more inclusive world. Once insight occurs, generally acceptance occurs.

Ample research has been conducted demonstrating various technological support of human endeavors to advance, learn, or transcend. In Chapter 3 I describe a method for researching and measuring the aesthetic experience with the novelty of viewing art in a digital environment of smart technology. I quantifiably measured emotional adjustments to fill the gap in the research literature about the possibility of engagement and enlivening the experience of art for participants with smart technology.

Chapter 3: Methodology

Introduction

The purpose of this quantitative study is to determine the extent to which a mobile art application with narrative influences scores on an aesthetic experience questionnaire. The study results may determine whether using mobile computer-mediated interaction (CMI) can mediate the aesthetic experience. This chapter describes the processes involved, instruments used, quantitative research used, and rationale for conducting the study. This chapter includes a description of the intervention and operationalization for each variable. Threats to validity are followed by a discussion of ethical procedures.

Research Design and Rationale

A quantitative study serves the present research best because it separates concepts easily and allows the resulting data to be measured and statistically modeled and analyzed. The aesthetic experience is usually researched with subjective interpretation. I used this approach to objectively measure within a scientific framework of a flow-type scale, the AEQF (Csikszentmihalyi & Robinson, 1990) and analyzed the primary target variable of the aesthetic experience, a distinct, psychological, human characteristic (Lindauer, 1973). Using the published AEQF (see Appendix A) contributes to validating the research because the AEQF is based on similarities of the flow questionnaire that has solid psychometric properties (Jackson & Ecklund, 2004; Moneta, 2012) and provided empirical data to find appropriate generalities related to the esoteric concept of the aesthetic experience.

The independent variable is the mobile application; the dependent variable is the change in subjects' attitude toward the aesthetic experience as measured by the AEQF questionnaire. The design and structure of the research was a classic experimental design consisting of an experimental group and a control group. This design can be summarized by the following schematic:

R: O_1 X O_2

R: O_1 O_2

where R represents random sampling, O_1 and O_2 represent pretest and posttest, respectively, and X represents the app intervention. Thus, the first line of the schematic represents the experimental group, who viewed the informative content of the mobile app, and the second line of the schematic represents the control group, who did not view the app's key informational content, indicated by the lack of an X. The groups were randomly assigned to their respective group.

Both the experimental group and control group participants used a mobile app intervention (*Breaking the Glass Wall of Art Appreciation* [BGWA]), but only the experimental group experienced the verbiage. The control group viewed artworks with only the title and artist's name under each artwork. The scores on the AEQF represented whether a person has an aesthetic experience. The primary dependent variable is the aesthetic experience differential (ΔAE), which represents the difference between an AE score from the pretest and the corresponding AE score from the posttest. The AE score was defined as the average score from two items chosen from the AEQF, which dealt specifically with the user's aesthetic experience.

I addressed the research question, To what extent do differences exist, if any, between participants' pretest and posttest scores on the Aesthetic Experience Questionnaire Form (AEQF) after participants use an art appreciation mobile application as compared to a control group?, by quantifying the differential between participants' pretest and posttest scores on the AEQF before and after undergoing a mobile app intervention with art. I compared the differential scores to a control group's scores whose mobile app lacked narrative content on general information about art history and theory and only had minimal information about the art. The presentation of the content of the two app interventions was distinctly different but contained the same artworks.

The experimental design is straightforward and therefore facilitates replication of the experiment. I selected pretest-posttest control group design because of its potential to provide comprehensive, internal and external validity, and because it was previously used in a similar study using AR (Chang et al., 2014). Because the experimental design approach does not require a large sample, has minimal time limitation, and does not incur expense (Campbell & Stanley, 1963; Frankfort-Nachmias & Nachmias, 2008), the pretest-posttest design was well-suited to the research. Because of its weakness in maturation, I rejected a quasi-experimental design. I considered a posttest-only control group design because of the strengths in internal and external validity; however, after careful consideration, I rejected this design because it may not validate the results and confirm the effect of the intervention because there would be no changes to compare, as when a pretest-posttest is employed.

Although Frankfort-Nachmias and Nachmias (2008) cautioned researchers that pretesting may cause "severe reactive effects" (p. 104) prior to the intervention and affect posttest outcome, I believed that the pretest could have the effect of decreasing the heterogeneous awareness of art in the control and treatment groups. It may also raise awareness of topics and issues and serve as a preparation to the intervention, serve to set a cognitive and affective disposition, and have more of a positive rather than negative effect on posttest outcome.

I used BGWA in the research as the intervention because I found no other available generic app on art in Apple's mobile application distributor, the App Store. Several other apps were available but were specific to an exhibit or a particular artist. In this research, I tested whether a general educational app, not tied to a particular artwork or exhibit, can improve performance in the area of experiencing art. The control group used the same app but with no narration. The art was the same in both apps.

The questionnaire that guided the present study was from the philosophical ideas of Csikszentmihalyi in relation to aesthetic experiences. I measured the app content for its influence on and the extent to which it enhances an aesthetic experience. Csikszentmihalyi and Robinson's (1990) questionnaire (see Appendix A) has items that relate to the intellectual, emotional, perceptual, and communicative dimensions of art as apprised by these two theorists.

Methodology

Population and Sample

The target population used in the study was composed of nonmuseum professionals, preferably participants educated in other fields outside of liberal arts, but this was not a requisite. My sampling was generally geographically located in Austin, Texas. G*Power software indicated the effective research size should be within 34-60 participants to achieve a statistical power between 0.8 to 0.9 with an effect size of 0.5. For reliability and to anticipate attrition, I sought 60 participants with 30 in each group.

I endeavored to select a sample of individuals who were never formally trained in aesthetics. Preferably, they were individuals who are now motivated to learn about art appreciation and are interested in an app that may expose them to art that their formal education did not include. The sample was between the ages of 21 to 80.

Sampling Procedures

I drew prospective participants from adult volunteers active in community organizations in the southwestern part of the United States and civic groups, such as Kiwanis. Participants were nonmuseum professionals as self-reported in a questionnaire that inquired about participant's age, gender, area of study and work field. There was no specific requirement for level of education or degree. I used demographic information to determine a representative sample of the target population for generalization purposes and for incidental information in chapter 5. The questions validated that participants were over age 21 and were nonmuseum professionals. Ideally, participants would be curious about how to read a painting and interested in viewing an app on art. I gave all

participants a printed directive (or email instructions) for completing the questionnaire at the PsychData website. PsychData is a nationally recognized online research development cloud company that has existed since 2001 to support the social science community. PsychData administers surveys and questionnaires to participants who are directed to their website. I arranged with PsychData to use their capabilities and obtained permissions to use their services. The benefit of using this nationally recognized corporation is neutrality and sophistication in conducting questionnaires.

To quantify the sample size that was required to answer my research question, I conducted a sample size power analysis using G*Power. Because I was interested in the difference between the differential scores from the experimental group and the control group using a repeated questionnaire, I estimated the required sample size using a one-tailed *t* test, an alpha of 0.05, and a power of 0.8, using a means differential between two independent means (two groups). I used a mean effect size of $d = 0.75$, which approximates Csikszentmihalyi and Robinson's (1990) study's mean differences. To protect against a Type I error, I set alpha to 0.05, so that if the null hypothesis was rejected, I could be 95% certain that the mobile app intervention increased average Likert ratings. Using a power of .8, I would need a total of $N = 46$ or 23 per group. Thus, the minimum number of total participants would be 46. To anticipate attrition, I sought 60 participants, with 30 in each group.

Csikszentmihalyi and Robinson (1990) did not provide their power analysis; therefore, I had no basis for a comparison in this study. To my knowledge no other researchers have used the AEQF to quantitatively measure the effects of an instructional

tool or any other intervention on art appreciation, and previous literature did not provide a clear indication of what effect size to expect. Csikszentmihalyi and Robinson (1990) published the mean responses to individual items on the AEQF. However, these published results did not report standard deviations or any other measure of dispersion, and I had difficulty generating expectations for the current study. However, Csikszentmihalyi and Robinson carried out statistical tests on the results and reported these results, which allowed me to make a rough guess for my power analysis.

Procedures for Recruitment, Participation, and Data Collection

I recruited volunteer participants at Austin civic groups and directed them to go to the PsychData website for further directives. The demographic information that I collected included age, area of study, area of work, and educational level as described by the participant. For example, a participant may have been 48 years old and described his or her area of study as engineering and work in technology. I used a consent form formulated by Walden University, and I asked participants to sign the form. For security purposes and to assure confidentiality, PsychData hand tabulated the personal information data collected. The remaining data were computer calculated. The participants clicked on a "submit" icon for the information to be sent to PsychData. No follow-up procedures were necessary. Participants could exit at any time using their on-off, submit button, or delete keys.

I prepared manila envelopes containing an expression of gratitude for volunteering with a notice of the time limitation for the research, a request to sign the enclosed consent form, and a directive on how to go to PsychData's website, use the

codes necessary to take the pretest online, and take the pretest. I provided a return envelope for the consent form. At the next meeting of the volunteer groups and civic groups I made an announcement about the research project after their sessions. The packages were available to volunteers wanting to participate as they left their meetings. In working with PsychData, I found that the entire research could be presented online. The same instructional information became available in an email to volunteers. After receiving permission from the URR to conduct the research, I attached the consent form to the questionnaire by PsychData. All participants signed a consent form online. Participants then took the tests and reviewed the app on their own time with their own device. Participants had 2 weeks to participate. Participants recruited solely via an online approach indicated their agreement with the terms of the consent form by clicking on the continue button provided. If they did not indicate their consent, the PsychData system, who administered the questionnaire, blocked the participant from going further. No personal identification was required and in doing so I protected the anonymity of participants. I did not need to follow up with the participants.

Additional Information on the Intervention

The nature of the intervention was a dedicated app providing generic (nonspecific to an exhibit) narrative about art and the aesthetic experience. The design of the app included examples of art from several art periods, information on seven art periods (Early Civilization, Medieval, Renaissance, 19th Century Romanticism, Modernism, Contemporary), eight basic elements of design and art (lines, space, subject, color, shapes, texture, movement, message), and information on seven affective responses to art

(joy, anger, pain, fear, shame, guilt, love, passion). The app was located at glasswall.mobi when not under construction. The control group app was located at glasswall.mobi/2/ when not under construction. After the participants completed a pretest of six personal questions, they answered a questionnaire consisting of 32 items responding to a Likert scale, ranked their three strongest responses, and reported which type of technology they used to take the questionnaire (see Section D of the AEQF). Though identity was protected, personal data about age, field of study, and work field were used for determining the inclusion of participants' data in the statistics. Otherwise, PsychData would delete personal data from all files and systems after completion of the study and acceptance by Walden. PsychData administered the questionnaires.

Instrumentation and Operationalization of Constructs

Instruments assisting the present study included the AEQF, the app (BGWA) with narration for the experimental group, the control group app with only art to view and no narration, the SPSS, Matlab, the smartphone or iPhone, and PsychData. Five of the six are highly technical and support the venture to explore the use of technology in the development of culture (Misa, 2011; Shlain, 1991) and how aesthetics makes "life richer, more meaningful and more enjoyable" (Csikszentmihalyi & Robinson, 1990, p. 188).

The last question of the questionnaire inquired about which technology participants used. Participants were instructed in the directive at the start of the questionnaire to use an iPhone, a smart phone. The last question verifies whether they did. This would make a difference in the data if they did not use an iPhone. If so, I did not use their input.

I elected to do a questionnaire for data collection in the interest of harvesting data from a sampling of the population, on possible response rate, and in determining more immediate response time, anonymity, and cost. Although a paper questionnaire may function adequately and display no difference in data collected (Ahern, 2005, p. 5), it may develop issues with response rate and response time and be more expensive (Frankfort-Nachmias & Nachmias, 2007, p. 207; Kumar, 2014). I elected to distribute the instrument online because of the ubiquitous and relatively egalitarian nature of technology. Accessibility, comfort factor, objectivity, and the anonymity factor contribute to the advantages of web-based research via an online survey that Trochim (2006) refers to as a "household drop-off survey" (Types of Survey section, para. 6). Creswell (2014) advised "survey research provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (p. 13). However, as Ahern (2005) advised, web-based research may limit generalizability and not represent the national population, some of whom are not computer literate. However, the study's results may have produced some data regarding the effectiveness of mobile device online learning, and the nature of the experimental question necessitated the use of technology. Mobile learning is a cutting-edge area in education (Kim, Mims, & Holmes, 2006; Keengwe, Pearson, & Smart, 2009).

Aesthetic Experience Questionnaire Form

The questionnaire form used, the AEQF, was originally created by Csikszentmihalyi and Robinson in 1990 in conjunction with their study of museum professionals and the aesthetic experience. Csikszentmihalyi (1990, 1992, 1996, 1997b,

2014) and colleagues (Csikszentmihayli & Csikszentmihalyi, 1991; Csikszentmihalyi & Hermanson, 1999; Csikszentmihayli & LeFevre, 1989; Csikszentmihalyi & Robinson, 1990) carried out numerous studies on the flow experience. Csikszentmihalyi is an eminent scholar in the area of intrinsic motivation, happiness, creativity, and optimism.

Csikszentmihalyi and Robinson's (1990) carried out their study to understand in depth the four dimensions of the aesthetic experience: intellectual (knowledge), communicative, emotional, and perceptual. Their participants consisted of various levels of museum professionals who were familiar with the aesthetic experience, and Csikszentmihalyi and Robinson called on their "refined perceptual skills, a wide range of knowledge, and emotional sensitivity" (p.73) and heightened awareness. The participants had dedicated their professional lives to the cause of art in working at the Getty Museum and the Art Institute of Chicago. The questionnaire was ideal to use in the present study because it has never been used to measure the aesthetic experience among the population that is not schooled in art appreciation. Further, the form measures perceptual, intellectual, emotional, and communicative responses from 50 participants and confirmed a parallelism between the concept of flow and the aesthetic experience. A high score indicates the aesthetic experience, whereas a low score indicates no aesthetic experience.

The findings of Csikszentmihalyi and Robinson's (1990) study showed that the Knowledge cluster was highest at 4.2 on a 6 point scale; Communication 4.0; Perception 3.6; and Emotion 3.5 (p. 98). They then analyzed these findings in relation to seven variants: highest degree earned; age; experience years in curatorial field; field of training; experience by area of specialization; experience by institution; experience by curatorial

position. The results were three of the seven contrasts were statistically significant: Knowledge rated highest because of field of specialization (ANOVA $p<.01$); Knowledge rated second highest because of Age (ANOVA $p<.05$); Knowledge rated third highest because of level of education (ANOVA $p < .07$) (Csikszentmihalyi & Robinson, 1990, p. 100). Their final conclusion was:

> We have seen that the tendencies gleaned from the interviews were to a large extent confirmed by the questionnaire study…These characteristics of the aesthetic experience were unanimously endorsed by experts regardless of how they had been trained and what they did. (p. 114)

In other words, Csikszentmihalyi and Robinson found that the aesthetic experience equated to flow and that experts in the area of art confirmed that. The results also indicated that of the four dimensions, knowledge was more important to art experts.

Among the questionnaire items reported by Csikszentmihalyi and Robinson (1990), a difference of 0.5 on the AEQF's Likert scale did not generally provide a statistically significant difference among the subgroups of the museum professionals responding to the questionnaire. However, differences of 0.75 to one on the AEQF's Likert scale did reveal significant differences among scores from various subgroups, differing in such dimension as field of study and years of experience in the arts. These tests were carried out on data consisting of $N = 52$ total participants. The 52 respondents constituted 62% of the target population of 82 museum professionals (Csikszentmihalyi & Robinson, 1990, p. 74).

Because my goal was to resolve differences between two groups that differ in their intervention history (i.e., whether or not they view the app with narrative content), using Csikszentmihalyi and Robinson's values as an approximate guide for my experimental design was reasonable. Based on their questionnaires' results, to detect a difference in approximately one point on the AEQF Likert scale, I needed to include approximately 60 subjects. The estimate was approximate and did not incorporate several important differences between the current study and the original research, such as the immediacy with which the instructional content would be applied (minutes to hours instead of years) and the use of a mobile app as the medium for intervention (which technology was not available at the time of the original study).

Permission to use AEQF. I obtained permission from Dr. Csikszentmihalyi (Appendix B) to use the published questionnaire and make specific changes to it. I changed some wording in the original questionnaire to add more clarity to the questionnaire (Table 2).

Table 2

Requested Changes in Wording in the AEQF

Page	Original wording	Requested wording change
193	Highest degree earned	Highest educational level
193	Please return it in the stamped and addressed envelope we have attached.	Please click "submit"
194	Sooner or later I get to know exactly what the artist…	Omit the word "exactly"
197	…the aesthetic experience sometimes is like being hit in the stomach.	…the aesthetic experience takes my breath away.

AEQF reliability. The questionnaire was previously used by Csikszentmihalyi and Robinson in 1990 and the results were published by The Getty Museum Educational Institute for the Arts. I altered the wording for this present study to adhere to both the semantic or conceptual findings of Csikszentmihalyi and Robinson, as they discovered age, years in the field, field of training, and perceived stature of the institutions employing participants influenced responses. For example, rating the importance of communication (an artwork imparting information) varied by place of employment, age, and years in the field. Curators who were older and more experienced valued the importance of communication. I found differences between curators with a B.A. as opposed to Ph.D.s, those employed at the Chicago Art Institute as opposed to the Getty Museum, and those who were in a classical department as opposed to others in modern art (Csikszentmihalyi & Robinson, 1990). These patterns indicate "various ways that

individuals construct the aesthetic experience…[and] approach art with different skills" (p.113). While knowledge was the key requisite among these museum professionals, the importance of communication, perception, and emotion "appears to be debatable" depending on personal background, professional position, and affiliate institutional mission (p. 115).

The AEQF has both strengths and weaknesses. The flow concept had been reviewed for 15 years before being compared to the aesthetic experience. However, Csikszentmihalyi and Robinson (1990) studied only phenomenological information and nothing on the unconscious level, for example, art preferences because of unconscious bias. The questionnaire items emphasize the art of seeing, not touching, and that the autotelic experience is available through all the other senses, not solely sight (Joy & Sherry, 2003).

There also seems to be a similar overlay of the strengths and weaknesses of the AEQF and Csikszentmihalyi's Flow Questionnaire ([FQ] Csikszentmihalyi & Csikszentmihalyi, 1988). Moneta (2012) assessed the FQ's strengths as definitionally sound in identifying the elements of flow; that flow does not assume that everyone experiences flow in the same way; does confirm the prevalence of flow within a specific context; and tests whether the subjective experience is more positive than in the anxiety and boredom states. The weaknesses of the FQ include little distinction between deep flow and shallow flow; no measurement exists for the intensity of flow in specific endeavors; and it does not measure the difference or balance between the challenge-skill ratio and other psychological states, for example, anxiety and boredom (Moneta, 2012).

These weaknesses were minimized with the construction of the FSS-2 (Jackson et al., 2008) that measures flow as a process rather than as an overall state. While the FSS-2 contributes to raising the gold standard for measuring flow, neither the long or short flow scale version relates to art. Flow has been measured using an experience sampling method (ESM) and an FQ, which "is a good measurement method for studying the prevalence of flow (Moneta, 2012, p. 29), whereas the ESM "imposes flow on respondents" (p. 40) because it incrementally tests the challenge-skill ratio at various times. Jackson et al. (2008) applied a componential approach to measure the flow frequency and intensity, which did not relate to this study.

Thus, Csikszentmihalyi and Robinson's (1990) work is considered psychometrically sound (Moneta, 2012). Because of its origin and association with art, the AEQF is more appropriate than the ESM or FSS-2 to measuring the possibilities of attaining the aesthetic experience when viewing art on a smartphone. The questionnaire items are more to the topic situation of flow and are not specific to art. When Csikszentmihalyi and Robinson used the AEQF, they reported their results in disaggregates, though in relation to transcendent experiences that take one out of ordinary life, the museum professionals agreed on a scale of 5.0 the mean was 3.1, indicating agreement but not of statistical significance (p. 90).

The flow theory, models, and measurements methods have changed very little since their inception in 1975 (Moneta, 2012). The ESM measures the prevalence of flow but does not validate the intensity of flow. The original FQ determined whether flow had occurred, not how it occurred (Csikszentmihalyi & Csikszentmihalyi, 1988) or the

intensity or level of flow in specific situations (Moneta, 2012). Though the flow model of measurement attained general regard (Jackson & Marsh, 1996), Novak et al. (2003) found that goal-directed processes (i.e., sports and marathon races) are more conducive to flow than experimental-directed processes.

AEQF validity. The AEQF is considered valid because the content was derived and originated from interviews with museum professionals from the Getty Museum and the Chicago Institute of Art. From these interviews, the constructs were derived to create the AEQF, which was based on the constructs of the aesthetic experience described by the museum professionals. In a qualitative content analysis, the constructs of the AEQF were then compared to those of Beardsley and flow theory and found to be tantamount. Although the instruments were validated, some reservation exists (Rheinberg, 2008) that there is a difference in measurement in assessing flow at the time of occurrence, during a performance or sporting activity, and then at a later time. According to Schuler and Brunner (2008), memory can affect the validity of retrospective measures. The present study had minimal lag in response time because participants took the posttest immediately after viewing the app.

Additional Research Instruments

BGWA (WIV Capital, 2014) is a 25-minute app on art. BGWA contains information about the cognitive and affective approach to understanding art. The app is appropriate to the current study because it reviews the seven art periods, the eight elements of art, eight affective responses to art, has a brief overview about aesthetic experience, and presents 42 renowned artworks. The app has not been published at this

time and WIV Corp. LLP retains the ownership. The authorship is automatically protected because it is in a tangible form and is uploaded on the Internet at glasswall.mobi. The app has been tested on a small population of WIV employees and the results are held by WIV. The company has allowed the use of their app for educational research.

The app fit well with the present study because it encompasses the flow concepts of cognition, perceptual, emotional, and transcendental movement (Csikszentmihalyi & Robinson, 1990). The app uses a kinesthetic learning approach of head, heart, hands and feet in looking at art so that the viewer can associate or remember a cognitive and emotional process. The process is seeing art with the whole body. (The feet icon is to be associated with historical perspectives of art; the hand icon is to be associated with formalism in art; the heart icon is associated with emotions; and the head icon is associated with critical thinking). The app also respects Dewey's (1934) perspective of art as experience that applied curiosity, inquiry, and discovery. Langer's (1979) perspective of art is also found within the app and emphasizes evocative, emotional response to art. The app content about art is not prescriptive; rather, it is explorational and experiential as in Dewey's constructivist approach to learning and art.

The app for the control group consisted of the same 42 artworks in the same order viewed by the experimental group, but did not include any narrative on the art periods, the formal elements of art, nor did it list the emotional context of art. The control group app was equivalent to walking and viewing art in a museum sans the use of any audio guide. Viewers were not equipped with any method for viewing art. As with the

experimental group app, the control group could view art at their own pace, leisure, and curiosity level. WIV Capital permitted the alteration of BGWA for educational purposes and for a version of it to be used by the control group.

Data Analysis Plan

To measure participants' expressed change of attitude, two items in the AEQF related to emotions, I used a two-sample *t* test to determine whether the experimental group's mean score on the aesthetic experience questionnaire form improved more than that of the control group. The pretest and posttest scores were repeated measures. To quantify the improvement score for each participant, I subtracted the pretest score from posttest score on each item in the AEQF. By using Matlab and Excel, I then compared the mean improvement in the experimental group with that of the control group using a two-sample *t* test. I first examined the questionnaire items that related explicitly to aesthetic experience, and then conducted follow-up tests to examine all questionnaire items, including those that deal implicitly with aesthetic experience. The questions relating explicitly to the aesthetic experience are:

> B10 – Art gives a sort of transcendent experience that takes you out of the realm of everyday life.
>
> C10 – Objects often seem to reach out and grab me; the aesthetic experience sometimes takes my breath away.

Each item on the AEQF (Appendix A) asks participants to respond with a score between 1 and 5. Aesthetic Experience (AE) was quantified as the difference of the scores entered in Parts B and Part C on items B10 and C10, which deal with the aesthetic

experience. For the aesthetic experience variable, I computed the difference between their values (posttest minus pretest) to achieve score difference: ΔAE. The hypotheses of this study were test with a *t* test. The *alpha value* of 0.05 was the criterion to decide whether sufficient evidence existed to reject the null hypothesis.

Some statistical precautions needed to be made to assure the quality of the data. Therefore, data cleaning included editing and screening prior to data analysis (Frankfort-Nachmias & Nachmias, 2008). I examined the data to determine if any data were missing and if patterns in the data suggested other anomalies or departures from my assumptions; for example, whether skewness or kurtosis was present for a particular variable. I used a Shapiro-Wilk test to determine any departure from normality. Bootstrapping confirmed the accuracy of the findings.

To analyze the data, I used Matlab and the Statistical Package for the Social Sciences (SPSS), a software package assisting with statistical analysis, data mining, scoring output or predicting numerical outcomes. Matlab also allows numerical and symbolic computing. The software was appropriate for this study because it scans and recognizes data from a spreadsheet that contains the scores directly captured from online questionnaires.

I identified and removed participants considered outliers who did not made a good faith effort to complete the experiment as judged by completion time or uniformity of answers. I included in this group participants who did not complete the questionnaire. If the random assignment was not indicated in the data, those questionnaires were excluded.

Threats to Validity

External validity and generalization were supported by randomization of the population assignments to groups. PsychData did random group assignments, and participants ranged in age from 21 to 80, with exclusion of museum professionals and docents trained in art appreciation. Boundaries of applicability may have been an issue if any participants were not adept or familiar with mobile devices and computer interactivity. Time and setting for participating in the research were not a threat to validity because the questionnaires and apps were online and available at all hours.

The pretest-posttest method is often used and widely considered a valid educational research tool (Campbell & Stanley, 1963). To produce a valid study, several measures must ensure internal validity. For example, immediately administering the posttest after the intervention minimizes confounding from maturation effects. The expectation in doing so is less flattening of the experience or learning curve. Otherwise, with a time lapse, a part of the human memory may be left unstimulated or unused, which may become a confounding variable (Campbell & Stanley, 1963).

Several items on the AEQF provide some measure of internal validity. For example, multiple items (B10 and C10) measure the extent participants had an aesthetic experience, and responses to these items can be compared to assess consistency. These items determine if the participants used a process for making associations in the app. This process is important because metaphors are associations, and art is a series of metaphors on canvas or paper. The number of associations determines the aesthetic experience (Jakesch & Leder, 2009). While the responses are individuated and ambiguous, the extent

of the responses is measured via the Likert scale provided (Frankfort-Nachmias & Nachmias, 2008). Likert scales themselves may fail to measure the true attitudes of participants as participants may find the five choices limiting or restrictive.

Using participants in an adult range was limiting because bias, in the form of pre-existing attitudes about art, has had more time for deeper development. Bias for or against types of art becomes a challenge whether the bias is conscious or unconscious. Preconceived ideas may limit a participant's ability to gain new knowledge in a field for which they are unacquainted. Because museum professionals have encountered art on a sophisticated level, I presumed they would be unaffected by the intervention and were, therefore, not included in the study.

The app used by the control group requires less time, and this time difference could have been a confounder that introduced differences in maturation between the two groups. The longer a person views a painting, the more apt the viewer is to have an aesthetic experience (Leder et al., 2005; Locher, 2011). If participants in the control group became intrigued with the artworks, viewed them with curiosity, and used the zoom feature to examine the artwork, perhaps they may have had an aesthetic experience; otherwise, having an aesthetic experience was unlikely. Looking at artworks does not engender the aesthetic experience; rather, seeing artworks with depth and spending time viewing it encourages the aesthetic experience. The control group app is similar to walking through a museum looking at art without benefit of an audio guide. Some viewers may revere art and others may view art lightly rather than at a tertiary level.

The internal validity of the data was protected if all participants completed the pretest, the intervention, and the posttest in succession with no time lapse in between. Potential maturation effects were assessed by PsychData's stamping the times the pretest and posttest are taken. This precaution made it clear if anyone delayed taking the posttest beyond the expected amount of time.

I alleviated the threats to construct validity by using the pretested AEQF designed by Csikszentmihalyi and Robinson (1990). I derived the items constituting parts B and C of the questionnaire from interviews of museum professionals, which further reassured the validity of the instrument. The interviews conducted by Csikszentmihalyi and Robinson suggested the unique qualities of the aesthetic experience as described by professionals in the art appreciation field.

Ethical Procedures

I obtained approval for the study from Walden University's Institutional Review Board (IRB #01-19-16-0139054) to ensure that I adhered to ethical procedures and that participants and the institution were well protected. I followed the research protocol required by the IRB. All information about participants will remain anonymous and will not be used for economic gain by any person or company involved.

Art by its very nature can be provocative, and I took precautions to prepare participants for what they would view. Some content, such as images of partial nudity or war, may be objectionable to some participants or trigger a reaction in predisposed participants. I informed participants that they could terminate their participation in the study at any time for any reason.

Personal data in the study were anonymous. The questionnaire did not require a name or other personal contact information. PsychData assigned numbers to participants. The only persons or institution that had access to the personal data or questionnaire responses were those officially connected to Walden University for the purposes of this study. After 5 years, I will destroy data. To minimize bias and maximize the validity of the study, participants of the study were anonymous and did not know any of the other persons involved with the study.

Summary

In this chapter, I described the method for researching and measuring the aesthetic experience, including instruments used, the data collection and analysis procedures, threats to validity, and ethical procedures. In this quantitative study, I used a pretest and posttest questionnaire (AEQF) and an intervention with an app (BGWA) to examine how art and technology affect audiences. The study results may provide information related to the fields of aesthetic education with technology. Participants may be transformed with a new sense of social cohesion because of cognitive and affective development as evidenced in Chapter 4.

Engaging in art and acquiring the relevant skills for experiencing art is a worthy endeavor that results in viewers gaining understanding of their culture and gaining a range and intensity of enjoyable experiences available through art. This study is dedicated to the delightful duty and colorful venture of providing adequacy and excellence in the salient features of aesthetic experiences and in providing the dynamics

of decoding art and communicating on a lofty and complex level in community with others.

Chapter 4: Results

Introduction

The purpose of this study was to determine the extent to which a mobile art application with a verbal narrative influences scores on an aesthetic experience questionnaire. This quantitative study assessed the change in attitude through participants' self-reporting of their aesthetic experiences after using an exhibit-nonspecific mobile application (app) featuring works of art. This chapter describes the implementation of the research design, threats to validity, analysis, evaluation, and summary of findings.

In this study I examined the relationship between a mobile application and self-reported aesthetic experiences. Limited or no research exists about whether viewers can have an aesthetic experience when viewing art on a smartphone screen. The results of this study attempted to fill gap in research literature of whether using smart technology mediates and engenders the aesthetic experience. Without the information that smart technology can support and mediate the aesthetic experience, art educators and museums may forego a possible avenue for extending art, the aesthetic experience may wan, and viewers' delight and engagement with artworks and art collections diminish. To address this gap, I researched this human-computer interaction by implementing a pretest-posttest experimental design. In this design, participants first completed a pretest that quantified their aesthetic experience, then interacted with a mobile app on a smartphone, and then completed an aesthetic experience posttest (identical to the pretest). Participants in the experimental group were given an app with full verbal narrative, while participants in the

control group were given a modified version of the app that included images of the artworks but lacked the verbal narrative. To assess whether the full version of the app could improve the aesthetic experience, I examined the improvement in scores from the pretest to the posttest. The key variable of interest was the response (Likert scale, 1-5) for each item on the AEQF (Appendix C). I performed statistical analysis of the differential scores (posttest minus pretest) to determine whether the experimental group improved more than the control group.

Participants came from a variety of the community organizations. I solicited them through email and texting network postings. I used the Statistical Program for Social Sciences (SPSS) and Matlab to analyze the data in light of the hypothesis. To verify the findings, I used the bootstrap method to recalculate and attain a straightforward statistical inference (Field, 2000).

Research Question

The research question that guided this study was: To what extent do differences exist, if any, between participants' pretest-posttest differential scores on the AEQF among participants who use the mobile app with narrative (experimental group) versus those participants who use a version of the mobile app without narrative (control group)? While the AEQF contained items relating to all four dimensions of the aesthetic experience, I chose two of the 32 items that dealt specifically with the emotional dimension of the aesthetic experience:

QB10: Art gives a sort of transcendent experience that takes you out of the realm of everyday life.

QC10: Objects often seem to reach out and grab me; the aesthetic experience sometimes takes my breath away.

For each item, I posed the following null and alternative hypotheses:

Null Hypothesis

$H_{0:}$ There will be no difference in posttest-pretest differential AEQF scores among participants who use the mobile app with narrative versus those who use the mobile app without narrative.

Alternative Hypothesis

H_a: There will be greater posttest-pretest differential AEQF scores among participants who use the mobile app with narrative versus those participants who use the mobile app without narrative.

Data Collection

Timeframe

The timeframe for data collection was February 11 to April 2, 2016. During that time, participants volunteered from civic organizations, Facebook networks, and through snowball sampling, and some of those who participated were asked to invite others to participate. I personally contacted via email approximately 100 prospective participants and asked them to send the questionnaire connection to others.

Recruitment and Response Rate

I initially intended to recruit participants with paper consent forms and printed directives to the questionnaire. In employing Psychdata, LLC, I found that recruiting online was more efficient than recruiting at civic organizations. This became apparent

when I attended Techbreakfast's monthly meeting and presented my request for participants during the meeting. Three of the 162 Techbreakfast members attending the monthly meeting participated in the questionnaire (2%). Another civic organization's president declined to allow me to present a request for participants at their general meeting but offered to send it via email to people in her email address book, constituting an origination point for snowball sampling. Other participants reported that they directed people to the questionnaire on their Facebook page. I sent email requests to a wide variety of prospective participants of different ages and in different parts of the United States. Because art is egalitarian, I did not require a specific group of people; rather, I preferred a cross-section of the community.

Of the 67 participants, 25 participants met the requisites of completing the pretest, viewing an app, and completing the posttest (Appendix D). I could not determine the overall response rate because in snowball sampling, there is no record of the number of people who viewed the electronic link to the questionnaire or how many people were asked or invited to view it. Because participants referred others to the site for the questionnaire, I did not know the percentage of those referred who chose to participate. The data could provide completion rate but not response rate because snowball sampling is a chain referral method considered a non-probability sampling technique.

Discrepancies in Data Collection

Several unexpected issues arose during data collection that limited the overall sample size: incomplete questionnaires; participants' computer skills; fatigue or loss of interest; technical anomaly. A number of questionnaires were incomplete. Such

questionnaires included missing responses on several items and 11 participants missing responses for the posttest altogether. Incomplete questionnaires may have resulted from participants being unable to navigate the process of exiting the questionnaire site, disengaging with to the app intervention and then re-entering the questionnaire site, reengagement after completing the app intervention, or because of fatigue or loss of interest. In most cases, data were recorded for participants' responses, but a few (16 of the 67 respondents) did not indicate any random stimulus assignment. This may be attributed to a technical irregularity, as the questionnaire site appeared to suffer from a technical anomaly that caused a failure to record responses from the group to which a small number of subjects were assigned (experimental versus control group). The underlying reason for some of the technical difficulties arose from the suboptimal implementation of the questionnaire protocol. It would have been ideal to program the protocol that allowed participants to proceed easily from the pretest, the app, and the posttest without a programmer going into the app's existing coding. However, the technology provider, Psychdata, LLC, was unable to accommodate this design feature. The questionnaires and apps could have been coded to flow continuously between one another, but accomplishing that would have been an expensive coding endeavor for which this project did not have a budget. In addition, an Apple, Inc. technician concluded some data may not have been recorded because of failure of the Wi-Fi connection to record the signal from the smartphone to the research company. Nevertheless, I obtained a sufficient sample size of 25 participants to reveal several experimental findings, as detailed below.

The experimental app required 20-45 minutes, depending on whether the viewer used a zoom feature to view the art or if they lingered over artworks. The control group's app consisted of 40 artworks with no verbiage regarding art or the artwork. The control group's app took 15-20 minutes, depending on whether a participant lingered and became engaged.

Demographic Characteristics

A total of 69 volunteers participated. Of those, 46 completed both the online pretests and posttests. I was unable to match two of the 46 who finished the posttest to their pretest because of the technical anomalies previously described. Of the remaining 44 volunteers, 32 indicated that they used a smartphone to complete the questionnaire. Finally, for seven of those 32 volunteers, I was unable to record the condition to which they were assigned because of the technical anomalies previously described. Therefore, I obtained a total of 25 valid, completed questionnaires. Of those 25 participants, 13 were in the experimental group and 12 were in the control group.

I examined demographic data for the participants. Demographic data are presented in Table 3. Of the 25 participants, 11 indicated male gender, and 14 indicated female gender. The sample represented a variety of ages: 0 in the 18-20 age group, 3 in the 21-30 age group, 6 in the 31-40 age group, 3 in the 41-50 age group, 8 in the 51-60 age group, and 5 in the 61+ age group (Table 3). The sample also spanned a variety of education levels: one completing high school, one with some college, 12 with an undergraduate degree, and 11 with a graduate degree.

Participants were adults between the ages of 18 to 65+ who have minimal

education in aesthetic education (i.e., nonmuseum professionals). Participants' prior art knowledge was self-reported in Part A of the AEQF (Appendix C). I first analyzed data for the difference in the questionnaire scores irrespective of age, education, area of work, or other population characteristics. I conducted a follow-up analysis (Table 5) to determine effects of gender, age, and level of education.

Table 3

Demographic Profile of Participants (n = 25)

Characteristic		*n*	%
Gender	Female	14	56%
	Male	11	44%
Age distribution	18-20	0	0%
	21-30	3	12%
	31-40	6	24%
	41-50	3	12%
	51-60	8	32%
	61+	5	20%
Educational level	High school	1	4%
	Some college	1	4%
	Degreed	12	48%
	Graduate degree	11	44%

Representative Sample and External Validity

Based on the demographic data obtained from this study's participants, my sample appeared to bear some relationship to the general population but departed from the general population in some respects. In terms of gender, 14 of the 25 participants (56%) indicated female gender, while the remaining 11 (44%) indicated male gender. This

distribution is not significantly different from the approximately equal distribution of males and females observed in the general population ($\chi^2 = 0.36$, $df = 1$, $p = 0.5485$).

To determine whether my sample represents the general U.S. population in terms of age, I compared the distribution of ages in my sample with the distribution of ages among U.S. adults at least 20 years of age (adapted from Martin et al., 2015). The distribution of ages in my sample was not significantly different from that of the U.S. adult population ($\chi^2 = 4.56$, $df = 4$, $p = 0.3355$). Thus, my sample appears to be representative of the general U.S. population in age distribution.

Finally, to determine whether my sample was representative of the general population in terms of education, I compared my sample to a distribution of educational attainment among the U.S. adult population aged 25 years and older (adapted from Martin et al., 2015). I found a significant difference in the distribution of educational attainment in my sample compared to that of the general U.S. adult population ($\chi^2 = 35.43$, $df = 3$, $p < 0.00001$). Table 3 reveals that my sample had a much greater proportion of participants with advanced degrees than the general population. Therefore, my sample was not representative of the general population in terms of educational attainment; rather, my sample was skewed in such a way as to overrepresent the highly educated.

In summary, my sample appeared to be representative of the general U.S. adult population in terms of gender and age, but the highly educated were overrepresented. Following is a discussion of the possible effect on my study results from this

overrepresentation of educated adults in my sample. Perhaps snowball sampling tends to move laterally in a social structure rather than crossing various social stratifications.

External validity and generalization were supported by randomization of the group (experimental vs. control) to which each participant was assigned. Boundaries of applicability were an issue because some participants were not adept with their smartphone and computer interactivity. Because the questionnaires and apps were online and available at all hours, time and setting for participating in the research were not a threat to validity.

Intervention Fidelity

Intervention Administration

Participants self-administered the intervention as they clicked on the art app link. Fidelity to the intervention (in terms of randomness) was assured because Psychdata randomly assigned the art app to participants. However, dexterity with the technology or technical problems may have prevented some participants from viewing the app or completing the questionnaire.

The scores on the Likert-scaled AEQF, as self-reported by participants, quantified the aesthetic experience. Stated reductively in Chapter 1, the dependent variable is the aesthetic experience. Stated consistently throughout the research, the dependent variable is the subjects' attitude toward the aesthetic experience as measured by the AEQF. The dependent variable (Likert score units) was processed for further analysis by subtracting the pretest from the posttest scores for two of the items on the AEQF: specifically Part B, item 10, and Part C, item 10. Participants answered the pretest, viewed an application,

and answered a posttest. Comparative measurement of answers B10 and C10 from the pretest to the posttest would indicate a change in attitude, if any. The objective of this study was to determine whether participants reported having an aesthetic experience (synonymous with attaining flow) after viewing art on a cell phone. I describe detailed discussions on the nature of the study, research question, and hypothesis in Chapter 3.

Challenges that prevented precise implementation of the intervention were respondents' technical level, technical issues with the questionnaire's site, and the length of the questionnaire. Psychdata could not sufficiently explain why there was no recording or indication of some participants being randomly assigned to an app. As a result, I researched the technical anomaly further with Apple, Inc. headquartered in California, whose engineer reasoned the omission of some data could be because of a variance in Wi-Fi connectivity. Of the 11 participants whose responses to the 32 questionnaire items were not recorded, left blank, some of those could be attributed to persons unsuccessfully attempting to participate and then entering the site a second time before successfully taking and completing the questionnaires. As previously reviewed, these issues reduced the size of my sample from the goal of $n = 46$ established by the power analysis I performed prior to data collection. However, the overall sample size of $n = 25$ ended up being sufficient to reveal several interesting effects of the app intervention, as evidenced by the statistically significant results obtained in the unplanned comparisons.

Study Results

To test my hypotheses, my data analysis plan called for a one-tailed, two-sample

t test for each of items B10 and C10. Because the results for items B10 and C10 did not reveal significant differences (possibility because of small sample size), I also carried out an additional test on items B10 and C10 combined, and a test on all 32 items combined. To prepare the data for the analysis of items B10 and C10 combined, I included two data points (the responses to items B10 and C10) for each of 25 participants, for a total $n = 50$ data points. Similarly, to prepare the data for analysis of all 32 items combined, I included 32 data points (the responses to each of the 32 items) for each of 25 participants, for a total $n = 800$ data points. I also conducted a two-sample *t* test for each of three dimensions of the demographic data (age, gender, and education level), and for each of four other subgroups of items that correspond to four themes identified by Csikszentmihalyi and Robinson (1990) (knowledge, perception, communication, and emotion). In total, I implemented two planned and nine unplanned comparisons.

To prepare the data for these tests, I carried out the following procedure. First, for each of the 25 participants, I computed the difference between the posttest and pretest scores to obtain a differential score (or improvement score) for each questionnaire item. Then, to determine whether there was evidence that the experimental group improved more than the control group (the alternative hypothesis), I performed a one-tailed, two-sample *t* test on the differential scores for each item, with a significance level of $\alpha = 0.05$.

Before beginning the hypothesis tests, I needed to verify several assumptions and conditions that are required for the *t* test procedure to be valid (Frankfort-Nachimas & Nachmias, 2008). First, the test requires that my data come from two independent groups. My *t* tests examined differences between the experimental and control groups. I assigned

each of my participants to exactly one of these two groups and came from independent groups; therefore, this condition was satisfied. Second, the *t* test requires that the variances of the two groups be approximately equal. Although my variances appeared to be similar (Table 4), to be safe I chose the version of the *t* test that does not assume equal variance. Finally, the *t* test assumes that the distributions of the dependent variable be normally distributed. I plotted a histogram of my data to assess normality informally, and both groups appeared to be normally distributed. To verify this intuition, I carried out a Shapiro-Wilk test of normality (Field, 2000). In contrast to my informal assessment, this test rejected my notion that the distribution of difference scores (posttest minus pretest) comes from a normal distribution for both B10 ($W = 0.8587$, $df = 25$, $p = 0.0026$) and for C10 ($W = 0.8881$, $df = 25$, $p = 0.0102$).

Because the data did not meet the *t* test's requirement for normality, I decided to proceed with caution and perform a bootstrap test (Green & Swets, 1966), in addition to the *t* test, for each of my comparisons to verify the results of each *t* test. In all cases, a bootstrap test confirmed the results of the *t* test, indicating that the departures from normality were not pronounced enough to lead the *t* test to false negatives or false positives within my data. In summary, I ran four tests in this section: an analysis of item B10, an analysis of item C10, an analysis after combining B10 and C10, and then lastely, I combined all 32 items and analyzed those for data. The reason for running the first two analyses was that those two items dealt explicitly with the aesthetic experience and were part of the original design (See Chapter 3, Data Analysis Plan). The last two tests were conducted because the results of the planned analyses were insignificant, and I suspected

a Type II error because of small sample size (see Analysis of Combined Items section). For each of the four tests described above, I carried out a *t* test, but I also carried out a bootstrap test because the assumptions and conditions for *t* test were not fully satisfied (specifically, the normality assumption was violated). Nevertheless, the bootstrap test verified the *t* test in all cases.

Analysis of Item B10

Item B10 stated, *Art gives a sort of transcendent experience that takes you out of the realm of everyday life.* Table 4 summarizes the descriptive statistics and the hypothesis test results for the differential scores presented in this study. Participants in the experimental group had a mean differential (improvement) score of 0.23, while those in the control group had a mean improvement of -0.08. The standard deviations of these differential scores were 1.01 and 0.79 for the experimental and control groups, respectively. The hypothesis test yielded a *t* statistic of $t = 0.86$. Using a $df = 22$, this test produced a value of $p = 0.8966$. This test is therefore not significant at the $\alpha = 0.05$ confidence level.

Analysis of Item C10

Item C10 stated, *Objects often seem to reach out and grab me; the aesthetic experience sometimes takes my breath away*. Participants in the experimental group had a mean differential (improvement) score of 0.46, while those in the control group had a mean improvement of 0.00. The standard deviations of these differential scores were 1.20 and 0.85 for the experimental and control groups, respectively. The hypothesis test yielded a *t* statistic of $t = 1.12$. Using a $df = 22$, this test produced a value of $p = 0.1374$.

This test is therefore not significant at the $\alpha = 0.05$ confidence level.

Table 4

Difference Scores (Posttet-Pretest) for B10, C10, and Combined

Item	Treatment	*n*	*M*	*SD*	*t*	*df*	*p*
B10	Experimental	13	0.23	1.01			
	Control	12	-0.08	0.79	0.86	22	0.8966
C10	Experimental	13	0.46	1.20			
	Control	12	0.00	0.85	1.12	22	0.1374
B10 & C10	Experimental	26	0.35	1.09			
	Control	24	-0.04	0.81	1.43	46	0.0797
All 32	Experimental	416	0.41	1.16			
	Control	384	-0.03	0.98	5.88	792	<0.00001

Analysis of Combined Items

In each of items B10 and C10, the experimental group showed a mean improvement (see Table 4), whereas the control group showed essentially no change in mean score (see Table 4). Despite the mean improvement among the experimental group, the *t* test did not produce a significant result for either items B10 or C10. For these reasons, I suspected the possibility that both tests suffered from a Type II error, perhaps because of too few participants. Inspection of the sample size and effect size lends support to this suspicion, especially in light of the power analysis presented in Chapter 3. That power analysis assumed a sample size of 46 and an effect size of 0.7. In contrast, my sample size was only $n = 25$ (because of technical problems with the data collection described above), and the effect sizes for both items were lower than 0.7

I reasoned that it may still be possible to detect significant improvements in questionnaire scores with a larger sample size. Therefore, I carried out an unplanned analysis by examining items B10 and C10 combined. The *t* test was identical to the tests performed on items B10 and C10 separately, but in the combined test, I had two data points (Likert responses) for each of the 25 participants, for a total of n = 50 data points. The descriptive statistics and the results of this test are summarized in Table 4. For both items combined and with a larger $n = 50$, participants in the experimental group had a mean differential (improvement) score of 0.35, while those in the control group had a mean differential of -0.04. The standard deviations of these differential scores were 1.09 and 0.81 for the experimental and control groups, respectively. The hypothesis test yielded a *t* statistic of $t = 1.43$. Using a $df = 46$, this test produced a value of $p = 0.0797$. This test is therefore aproaching, but not quite, significant at the $a = 0.05$ confidence level.

Because the test results for items B10 and C10 combined revealed a stronger, approaching significant effect, I became more certain that the lack of significance may be because of an insufficient sample size. For this reason, I went a step further and carried out a second unplanned analysis of all the items combined. The combined data had a total $n = 800$ (32 items for each of 25 participants), instead of the $n = 25$ for items B10 and C10 separately. The descriptive statistics and the results of this test are summarized in Table 4. For all items combined, participants in the experimental group had a mean differential (improvement) score of 0.41, while those in the control group had a mean differential of -0.03. The standard deviations of these differential scores were 1.16 and

0.98 for the experimental and control groups, respectively. The hypothesis test yielded a t statistic of $t = 5.88$. Using a $df = 792$, this test produced a value of $p < 0.00001$. This test is therefore significant at the $a = 0.05$ confidence level.

Effects of Gender, Age, and Education

To further understand the conditions under which an app-based intervention can influence the aesthetic experience, I examined whether the differential scores I observed were more pronounced for some demographic groups than for others. Because my main results indicated that participants in the experimental group showed significantly greater improvements in AEQF scores after experiencing the app intervention in comparison to the control group (see Table 4, "All 32"), I examined whether age, gender, or education level could predict the size of these effects within the experimental group (Table 5). To this end, I carried out three unplanned, two-sample t tests on the differential scores from the experimental group according to age, gender, and education.

First, I examined the effects of gender on the main results. I partitioned the 13 participants in the experimental group into male ($n = 7$) and female ($n = 6$) genders and tested whether the mean differential (improvement) scores were significantly higher for either of the two halves of the data. The improvement scores among males ($\overline{x} = 0.60$, $SD = 1.23$) were larger than the improvement scores among females ($\overline{x} = 0.19$, $SD = 1.03$), and this difference was highly significant ($t = 3.67$, $df = 414$, $p = 0.00027$, two-tailed test). These results show that on average, males improved three times as much as females after experiencing the app-based intervention.

Next, I examined the effects of age on the main results. I partitioned the 13 participants in the experimental group into above-median (n = 7) and below-median (n = 6) ages, and tested whether the mean differential (improvement) scores were significantly higher for either of the two halves of the data. The improvement scores among the older half of the data ($\overline{x}$ = 0.44, SD = 1.20) and the improvement scores among the younger half of the data ($\overline{x}$ = 0.39, SD = 1.12) were not significantly different from one another (t = 0.429, df = 394, p = 0.67, two-tailed test). These results show that there is no evidence that younger adults improved any more or less than older adults after experiencing the app-based intervention.

Finally, I examined the effects of education on the main results. I partitioned the 13 participants in the experimental group into below-median (n = 7) and above-median (n = 6) educational attainment, and tested whether the mean differential (improvement) scores were significantly higher for either of the two halves of the data. The improvement scores among the more educated ($\overline{x}$ = 0.32, SD = 1.17) were slightly lower than the improvement scores among the less educated ($\overline{x}$ = 0.49, SD = 1.14), but this difference was not significant (t = 1.44, df = 402, p = 0.15, two-tailed test). These results showed that there is no evidence that more educated adults improved any more or less than less educated adults after experiencing the app-based intervention.

Table 5

Demographic Tests of Gender, Age, and Education

Variable	Group	*n*	*M*	*SD*	*t*	*df*	*p*
Gender	Male	7	0.60	1.23			
	Female	6	0.19	1.03	3.67	414	0.00027
Age	Older	7	0.44	1.20			
	Younger	6	0.39	1.12	0.429	394	0.67
Education	More	7	0.32	1.17			
	Less	6	0.49	1.14	-1.44	402	0.15

Csikszentmihalyi-Style Analysis of Four Groups of Questionnaire Items

To facilitate comparison of my results to those that Csikszentmihalyi and Robinson (1990) obtained in their original experiment, I partitioned my data into four groups following their original analysis. The first group included items related to knowledge (C1, C6, C9, and C16); the second included items related to communication (C2, C5, C8, C14); the third related to emotion (C4 and C12); and the fourth related to perception (C7, C10, and C14). I performed four additional unplanned, one-tailed, two-sample *t* tests to understand whether my main result, that participants in the experimental group improved more than participants in the control group, held when looking at small sets of questionnaire items that are grouped according to Csikszentmihalyi and Robinson's general themes (Table 6).

When examining only knowledge-related items (C1, C6, C9, and C16), my results showed greater improvement among participants in the experimental group ($\overline{x} = 0.69$, $SD = 1.16$) than those in the control group ($\overline{x} = 0.04$, $SD = 1.01$). These differences were

statistically significant ($t = 2.99$, $df = 98$, $p = 0.00176$, one-tailed test), indicating that my main results held when this subgroup was examined separately.

I next examined a subset of the questionnaire items that relates to communication (C2, C5, C8, C14). My results showed greater improvement among participants in the experimental group ($\bar{x} = 0.48$, $SD = 1.02$) than those in the control group ($\bar{x} = -0.08$, $SD = 1.09$) and these differences were statistically significant ($t = 2.67$, $df = 96$, $p = 0.0045$, one-tailed test), indicating that my main results held when this subgroup was examined separately.

Table 6

Difference Scores (Posttest-Pretest) for Four Themes of Questionnaire Items

Theme	Treatment	*n*	*M*	*SD*	*t*	*df*	*p*
Knowledge	Experimental	52	0.69	1.16			
	Control	48	0.04	1.01	2.99	98	0.00176
Commun.	Experimental	52	0.48	1.02			
	Control	48	-0.08	1.09	2.67	96	0.0045
Emotion	Experimental	26	0.19	1.33			
	Control	24	-0.33	0.96	1.61	46	0.057
Perception	Experimental	39	0.26	1.23			
	Control	36	-0.08	1.25	1.18	72	0.12

When examining emotion-related items (C4 and C12) only, however, my results showed no greater improvement among participants in the experimental group ($\bar{x} = 0.19$, $SD = 1.33$ than those in the control group ($\bar{x} = -0.33$, $SD = 0.96$) when examined with a *t* test (*t*

= 1.61, *df* = 46, *p* = 0.057, one-tailed test), indicating that my main results could almost, but not quite, be detected when this subgroup was examined separately.

Finally, I examined a subset of items that relates only to perception (C7, C10, and C14). My results did not find evidence for greater improvement among participants in the experimental group ($\overline{x}$ = 0.26, *SD* = 1.23) than those in the control group ($\overline{x}$ = -0.08, *SD* = 1.25) when examined with a *t* test (*t* = 1.18, *df* = 72, *p* = 0.12, one-tailed test), indicating that my main results could not be replicated when this subgroup was examined alone.

I performed a total of 11 comparisons: two planned, and nine unplanned. The planned comparisons tested for differences between the experimental group's and control group's improvement scores on items B10 and C10. Two unplanned comparisons tested this same hypothesis on items B10 and C10 combined and on all 32 items combined. I carried out three unplanned comparisons based on demographic data of gender, age, and education. Finally, I made four unplanned comparisons to test my hypothesis for four different subgroups of items, grouped according to general themes identified by Csikszentmihalyi and Robinson.

Unplanned comparisons can increase the likelihood of false positives. For this reason, I performed a Bonferroni correction to each of my tests to correct for the increased risk of false positives. I adjusted the significance level from $\alpha = 0.05$ to $\alpha^* = a/c = 0.05/11 = 0.004545$. In all of the comparisons performed here, the test outcomes remained the same. That is, any test that was significant at the 0.05 level survived the Bonferroni correction for multiple comparisons. This result held for all 11 *t* tests and for the 11 corresponding bootstrap tests.

Summary

In this study the extent to which participants could have an aesthetic experience on a smartphone after viewing an exhibit-nonspecific mobile app intervention was measured. The aesthetic experience is not a quantal experience, but rather has degrees of intensity like all emotional experiences. To quantify this experience I used a research tool, the AEQF, which has been used previously to quantify aesthetic experience using a Likert scale. I compared scores on this questionnaire before and after participants viewed an app intervention with instructional verbiage (experimental group) or one without instructional verbiage (control group).

My hypothesis was that the app intervention would improve scores on two items from the questionnaire (items B10 and C10). The results did not indicate significant evidence to support my hypothesis. However, because of technical difficulties during data collection, my sample size was considerably smaller than what my power analysis required. Therefore, I reasoned that increasing the sample size by combining the items may reveal significant effects. The results of these follow-up tests indicate strong support for my research hypothesis. These latter results survive statistical adjustment for unplanned comparisons, lending support to my hypothesis that a mobile app intervention can indeed influence aesthetic experience. Having found strong support for my hypothesis, I carried out several follow-up analyses. First, I examined whether any of my demographic variables could predict the size of the improvement in AEQF scores following the app intervention. I found statistically significant evidence that males tended to improve an average of three times as much as females in the experimental group, but I

failed to find any evidence that age, gender, or educational attainment could predict the size of the observed improvements.

Finally, to facilitate comparison of my results to those obtained by Csikszentmihalyi and Robinson (1990) in their original study that employed the AEQF, I partitioned my data into four subgroups of items and tested my hypothesis for each of the four groups individually. I found support for my experimental hypothesis (that participants in the experimental group improve significantly more than those in the control group following the administration of an app intervention) when separately examining questionnaire items that related to knowledge and communication, but I did not find evidence for improvement when examining only items that related to emotion and perception.

In Chapter 5, I explore these results as they relate to my original experimental questions and in light of the previous literature. I also discuss possible reasons for the lack of significance in some of these comparisons. Finally, I provide interpretations of these findings and offer several speculations on what they mean for the future of art education, art education research, and museum practices.

Chapter 5: Discussion, Conclusions, and Recommendations

This chapter includes the purpose and nature of the study, interpretive findings, and a summary of the social implication of extending art via technology. The results validate the direction and mission of entities placing art online, such as the Google Art Project, and the notion that viewing art online democratizes art and enriches the human experience, which could be an avenue for positive social change. I review the limitations and findings of this research and offer recommendations for areas of future research. The chapter concludes with the value of humanities and why art and technology are viable research studies in the digital age.

Review of Purpose and Nature of the Study

The aesthetic experience can be defined as transcendence, elation, and various emotional responses: joy, sadness, or empathy, and is one of the most enriching and transcending responses available in life. While transcendence is possible within several human behaviors and endeavors, the arts are a vehicle for making life more enjoyable. To extend art and make it available to all, museums and visual arts educators need to know the extent to which viewers can appreciate art when using technology. The purpose of this study was to determine whether people can have an aesthetic experience when viewing art on a smartphone. In this study, I quantified the aesthetic experience as a change in attitude as indicated, expressed, and measured as a difference between scores on pretests and posttests. I asked whether viewers experience a change in attitude while viewing art through modern media. To this end, the method of inquiry was to conduct a quantitative study using a Likert scale questionnaire (Campbell & Stanley, 1963). I

analyzed the data using the Statistical Package for the Social Sciences (SPSS version 21) and Matlab, a numeric computing program. Under the theoretical principles of the flow concept, I used an online version of the AEQF from which to gather data and determine the change in attitude. The intervention between a pretest and a posttest was a mobile application of art. The null hypothesis was that there would be no difference in posttest-pretest differential AEQF scores among participants who use the mobile app with narrative versus those who use the mobile app without narrative. The key findings, summarized below, indicated that aesthetic experience can be achieved while viewing art on a mobile device medium.

The value of the findings is both idealistic and pragmatic. Understanding the viable usage of technology with the arts affects the quality of the richness of living. Because cell phone usage increased 19% in 2015 (Smith, 2015), and U.S. arts attendance at museums has declined 6% annually since 2012 (National Endowment for the Arts [NEA], 2015), museum officials are looking for a pragmatic and efficient way to extend their art collections for leisure time enjoyment and cultural enrichment. The findings of this study confirm smartphones can mediate the optimal experience museums and art educators aspire to deliver.

Research was needed to determine whether viewers report having an aesthetic experience when viewing art on a smartphone screen. Therefore, I used a quantitative experimental method of inquiry to examine the relationship between an instructional mobile application and self-reported aesthetic experiences. I addressed this issue by quantifying the differential between participants' pretest and posttest scores on the AEQF

before and after undergoing a mobile app intervention. The differential scores of participants in the experimental group (who experience the mobile app with instructional verbiage) were compared to those of an experimental group (who experience the instructional app without verbiage). To analyze the data, I used the Statistical Package for the Social Sciences (SPSS version 21) and Matlab. My major research hypothesis was that there would be a change in attitude after the intervention of an art app, resulting in higher differential scores among the experimental group than among the control group.

My hypothesis predicted that participants in the experimental group would show an increase in scores on items B10 and C10 because these items relate to emotions associated with the aesthetic experience. Item B10 states, "Art gives a sort of transcendent experience that takes you out of the realm of everyday life," and item C10 states, "Objects often seem to reach out and grab me: the aesthetic experience sometimes takes my breath away" (Appendix C). However, the results from these items individually were inconclusive, failing to reach statistical significance, possibly in part because of attrition and technological complexities with the questionnaire as reviewed in Chapter 4. In retrospect, perhaps I should have included more than two questionnaire items relating to emotions and the aesthetic experience within the original AEQF designed by Csikszentmihalyi and Robinson (1990). Increasing the number of emotion-related questions would put the importance of the emotional dimension on par with the other dimensions of aesthetic experience such as knowledge, communication, and perception, each of which have three or four questions on the AEQF. Perhaps the intervening app contributed to original disappointing results or the expectations of the participants who

were educated that knowledge about art rather than experiencing art is the optimal approach. In addition, because the questionnaire items and app were not seamless, some participants did not return to the questionnaire site to take the posttest. To overcome these technical issues, I broadened my examination to include all 32 questionnaire items on the AEQF, as reviewed in detail in Chapter 4. After data analysis of the entire 32-item pretest and posttest questionnaire, findings indicated a significant change in attitude that indicates a transcendental experience.

The results of this experimental study, which used a control group pretest and posttest design, showed that flow was possible in a computer-mediated environment, but with the caveat that the artifact of a computer can enhance or diminish the aesthetic experience (Finneran & Zhang, 2005). For example, high-resolution reproductions of the *Mona Lisa* can reveal details that are invisible to the in-situ viewer, potentially leading the computer-mediated viewer to new knowledge that enhances the transcendent experience. On the other hand, the ominous mood invoked by some large paintings cannot be conveyed through a small screen. In addition, computers can add a social dimension to the aesthetic experience to create a shared experience with large numbers of people that could not be possible in person. Therefore, while the current study has documented evidence that the aesthetic experience is possible to achieve through mobile technology, I did not explore the intensity of the experience or the variations of aesthetic experience that emerge from the technology itself.

Interpretation of Findings

The results of this study contribute new knowledge to the field of aesthetics and technology (Chang et al., 2014; Di Serio et al., 2013; Finneran & Zhang, 2005; Lopreiato, 2014; Marlow & Dabbish, 2014; Pierroux & Ludvigsen, 2013; Redies, 2015). First, few quantitative studies on aesthetic experience exist in the peer-reviewed literature; instead, most studies focus on the more qualitative aspects of experiencing aesthetics (Lopez-Sintas et al., 2012; Marković, 2012; Marcus, 2014). I reviewed a sampling of these studies in Chapter 2. Cyberaesthetics and hybrid reality are new frontiers for the humanities in web aesthetics and cyberculture (Zawojski, 2014). This study contributes to the field by providing quantitative data about optimal human behavior when viewing art within technology.

Second, as reviewed in Chapter 2, my research builds on the research of others who addressed transcendence within art and technology (Finneran & Zhang, 2005; Serrano-Puche, 2015). For example, Finneran and Zhang (2005) carried out a study in which participants used the prevailing technology at the time (i.e. desktop computers) to assess the possibility of aesthetic experience through technology. The current study updates these findings by extending the study of technology-mediated aesthetic experience to today's prevailing technology, i.e., smartphones. Thus, the current study brings the field up to date with recent changes in the fast-evolving field of technology.

Third, the current study broadens the scope of previous studies that explored the role of technology in art education (taking place in the classroom and the museum). In contrast to these previous studies, the current study demonstrates that the aesthetic

experience can be achieved with mobile technology on a small screen, which expands the educational setting to anywhere and anytime a smartphone can be used.

Fourth, the current study examines the technology-mediated aesthetic experience in a more representative sample of the population. Previous researchers looked at these relationships as they occur mainly among museum professionals and art history students. In contrast, the current study expands the population to include everyday people, not just people who are educated in the arts. The wider population included in this study makes its results relevant to a much larger group of people who will ultimately benefit from the theories presented historically in this field.

Csikszentmihalyi and Robinson (1990) initially provided a hermeneutic analysis of philosophical perspectives of the aesthetics beginning with Plato though Danto and to the skepticism of Carroll to explain the phenomena under study. I provided a summary of the various concepts of the aesthetic experience in this study in Chapter 2. Csikszentmihalyi and Robinson (1990) quantitatively verified that the aesthetic experience, as described by Beardsley in his philosophy of art, aligned with the content and context of requisites for the theory of flow (Table 1). They extended Beardsley's philosophical perspective of aesthetics to the psychological model of flow to the arts and found the model to be applicable and parallel. As noted earlier, Finneran and Zhang (2005) applied the concept of flow to computer-mediated environments and found that the transcendence of flow was possible within the new environment, but that the artifact of the technology itself can add or remove dimensions to that virtual viewing experience. This dimension involves simulated, cybernetic transference into a mechanism that shares

the emotions not only in the person's embodiment with art, but also into a virtual reality rather than the actuality of seeing the art in person. These conscious physical responses to an emotion generated by art and the senses and the unconscious proprioceptive responses of widening of the pupils, or dropping of the jaw, or hair rising on skin, constitute a human embodiment to art. Seeing the 51 x 172 inch painting, *The Triumph of Aemilius Paulus* (1789), by Carle Vernet in person or online engages many of the senses. (Seeing the artwork on a smartphone or computer is more engrossing because of the mobility and zoomability that is not possible when seeing the art in situ.)

My research interest was in determining whether viewers could achieve an aesthetic experience via smartphone technology. I only found one questionnaire that related to the aesthetic experience. The research instrument I used to explore my research interest was the AEQF, a questionnaire form that contains 32 items, all of which relate to the aesthetic experience. It was the only questionnaire available for quantitatively measuring change of attitude. The aesthetic experience is rather elusive because the "aesthetic experience is highly individual, with observers varying significantly in their responses to the same artwork" and only fMRI analysis measures such varied responses (Vessel et al., 2012, p. 235). A User Experience Questionnaire (UEQ) exists that measures interactivity with a product (Rauschenberger, Schrepp, Cota, Olschner, & Thomaschewski, 2013); however, that was not the point of this research, which was to measure the contextual possibility of the aesthetic experience in smartphone technology's virtual environment. The field of music may be more progressive as it has a continuous response digital interface (CRDI) that indicates perceived aesthetic level using a dial

manipulation corresponding to the experience when listening to music (Madsen, Brittin, & Capperella-Sheldon, 1993).

In Section B of the AEQF, Csikszentmihalyi and Robinson (1990) explored approaches to art. Within section C of the questionnaire, the four dimensions of the aesthetic experience were knowledge, perception, communication, and emotions; these dimensions were classified accordingly with four items related to knowledge, four items related to communication, three items to perception, and two items related to emotions, totaling 13 questions. The remaining four items in section C were rather obscure. I selected items B10, "Art gives a sort of transcendent experience that takes you out of the realm of everyday life," because it mentioned transcendence and C10, "Objects often seem to reach out and grab me: the aesthetic experience sometimes takes my breath away" was selected because it explicitly mentioned the aesthetic experience (Appendix C).

In the original Csikszentmihalyi and Robinson (1990) study, those two questionnaire items did not reach statistical significance. This result was mainly credited to the field in which the museum professional participants worked, which it apparently biased their responses. Therefore, Csikszentmihalyi and Robinson recommended "Further in-depth inquiry into this matter definitely seems warranted" (p. 90). Because I sought nonmuseum professionals with little training and no employment in the field of aesthetics as participants, I anticipated different results from the two questionnaire items, but they were similar to the findings of Csikszentmyhalyi and Robinson in not reaching statistical significance. From there, I performed unplanned comparisons that analyzed the data of all

32 questionnaire items collectively, as did Csikszentmyahlyi and Robinson. My principal finding in examining the 32 questionnaire items of the AEQF collectively is that viewers can experience a measurable change in attitude when experiencing art in a virtual environment on a smartphone (Table 4). The results of this study show these subjective changes were measured quantitatively.

In grouping the questionnaire items into four categories of knowledge, communication, emotion, and perception, as did Csikszentmihalyi and Robinson (1990), I discovered that among nonmuseum professionals who participated in this research, responses to questionnaire items directly related to knowledge and communication showed strong evidence of being affected by the app intervention. The effects on items related to emotion and perception did not reach statistical significance. These rankings could indicate that viewers still think knowing about the artwork is of more importance than having feelings for it. However, emotionally connecting to paintings could have ranked low as a result of using fewer items for this category.

As seen in Table 5, analysis of the demographics of my sample revealed interesting patterns. First, among the experimental group, males improved more than females by a factor of three to one. In addition, those participants with more education improved more significantly than participants with lower levels of education, also by a factor of three to one. Finally, despite the differences related to educational level, age did not appear to be a factor in determining the degree to which participants were affected by the app intervention. Few researchers have attempted to verify the phenomenon of the aesthetic experience within the complex and limited computer-mediated environment of

smartphones. The smartphone adds a complexity with its limited dimensions. However, the mind can go beyond limitations of personality traits and environmental states necessary to attain an aesthetic experience and can go to a realm that allows emoting and imagining. Understanding the possibilities and the magnitude technology has on human behavior when viewing art will prevent museums from becoming mortuaries, create innovative ways of delivering art globally, and bring artworks to viewers' fingertips to absorb and explore. The value and benefits of the aesthetic experience are apparent, and the implications and results of this research may contribute to enhanced smartphone design, such as zoomability that can be conducive to encouraging, expanding, and amplifying the user experience in the optimal engagement with art (Chen, Qian, & Lei, 2016; Endsley, 2016).

Limitations of the Study

In Chapter 1 I reviewed how personal bias about art, screen size of the device for viewing art, and the apps may influence responses. The art with verbiage may have maintained the viewers' attention longer, which is conducive to an aesthetic experience (Locher, 2011).The app without verbiage may not be as conducive to focused attention, a requisite of flow. These issues were not as prominent as technical issues as described below in relation to sample size. I did not measure the types of art participants prefer, nor did I measure the length of time participants spent viewing the various artworks and which they preferred among the 40 artworks. I also did not measure intensity and duration of the focused concentration in the experience. In this study I believed that it was important to first establish the "what" in a quantitative study as opposed to the

"why" within a qualitative study. In other words, the results indicated a yes or no cumulated response to the necessary preliminary question of whether or not participants responded to art in the virtual environment of a smartphone. Later researchers may examine why they responded as they did.

Limitations of this study relate primarily to a small sample size. The size of my sample was originally to be $n = 46$ as established by the power analysis I performed prior to data collection; however, the overall sample size of $n = 25$ ended up being sufficient after disqualifying some data because of technical difficulties. Several variables limited the number of participants with valid data that could have been useful for further analysis. First, not everyone has the capacity for extraordinary sensitivity to visual stimuli. Second, some participants had time limitations for browsing and enjoying art intently, and others found the sequence of the pretests and posttests technically difficult to maneuver on a smartphone. In addition, even for those participants who completed both questionnaires and yielded valid responses, technical issues with the data collection process further limited the sample size. For example, although all participants were assigned a condition indicating which version of the app they would experience, technical issues prevented these condition assignments from being recorded. Similarly, for several participants, the lack of linking IDs prevented me from correctly matching pretest and posttest responses. Nevertheless, I was still able to analyze a sufficient number of responses to uncover significant changes to the questionnaire responses, in line with my experimental hypothesis.

For the purposes of researching nonmuseum professionals, the general population was investigated in the current study, which yielded a variety of opinions about the length of the questionnaire. Some believed the questionnaire was too lengthy. This fact may have been responsible for some of the attrition described above. However, some feedback from participants revealed that they found the 32 questionnaire items intriguing and a distraction from their reality and the world, as one participant told me she had not thought about art in a while. Therefore, some participants found the questionnaire to be an acceptable length or perhaps even too short.

The AEQF itself may have had contextual limits because of to the definition of the aesthetic experience within the terms of the flow theory that originates in psychology. In Chapter 2, I reviewed several ideas in addition to flow that enrich understanding the aesthetic experience (Dissanayake, 2000; Dokie, 2016; Kandinskky, 1977; Kant, 1987; Kierkegaard, 1981). I also did not measure which of the criteria for the aesthetic experience (Table 1) was more heightened among the participants. I did not measure the aesthetic quality of the experience. However, this study was a preliminary study in empirical aesthetics with technology.

While there is no extensive comparison between the findings of Csikszentmihalyi and Robinson's (1990) findings and this study's findings, the advantage in their study was to first interview their participants for their acumen about the aesthetic experience prior to the pretest and posttest. I asked for the field in which the participants worked, their area of study, but did not analyze or relate this information to the hypothesis to be proven in this study. I also did not ask about participants' interest in art; thus, I could not

determine if interest influenced the way participants answered. However, usually people participate in those studies that interest them.

Another limitation of the current study comes from the nature of my dependent variable. I attempted to quantify a subjective experience. The only standardized instrument designed for this type of study was the AEQF. Research among current literature did not indicate there were other dependent measures. Likert and similar scales have been used for years to aid in quantifying subjective experiences with varying levels of success. However, the particular subjective experience I wished to study was that of flow, or a transcendent experience involving loss of self and time. In this case, the mere act of reporting this experience (by reducing it to a number) can interfere with the experience itself. The fact that my participants knew in advance that they would be asked to answer questions about the artworks is likely to have interfered with their willingness or readiness to lose self during the viewing period. As in any study, the manner in which the researcher asks a question can interfere with the measurement and bias participants' responses. However, because in this study I quantified a special class of subjective experience that requires a viewer to lose track of the real world and the responsibilities that come with it, the improvements I observed may have been underestimates of the true magnitude with which an instructional intervention can increase the flow experience and how technology can mediate the experience.

Recommendations for Future Research

Previous researchers have examined which factors make technology compelling to the user and what makes art compelling to the viewer. When the two are combined,

virtual worlds become a rich environment for extending the globalization of art and extending the social motivational aspects of art: immersion in the form of curiosity, entertainment, relaxation, and escapism; awareness of others and other cultures; and accumulation of knowledge. To further understand the benefits derived from digital aesthetics and engaging with the arts online, additional studies are needed to determine how technology can increase the likelihood of the aesthetic experience and to determine whether the virtual stimulus on one hand, or the mental and emotional processing on the other hand, is most conducive to precipitating the aesthetic experience. Digital technologies now pervade philosophy and psychology.

Although the results from this study confirmed that flow, a philosophy about engagement, is possible when using technology when viewing art, further research may be directed to the nature of technology and social effects and ethical and moral boundaries. For example, if technology can distort the *Mona Lisa* with green hair and then sold, this creative license could become an ethical issue and a copyright infringement. Sound philosophy needs to be researched to guide the technical reproduction of art with respect to artists and laws.

Cyberaestheics, art viewed in a virtual environment (as opposed to cyberart that is art created by software and hardware), exists in a virtual world that is a computer-based, simulated environment (Bartle, 2004). As technology and its use can "sometimes constitute the substance and the essence of art" (Lopreiato, 2014, p. 425), a reasonable assumption is that it can mediate art. Because art exists in a virtual world, a qualitative study might assess how art in a virtual world relates to the aesthetic experience with its

various definitions and how it is enriching cultures and individuals. Knowledge of how people experience art and emotions and decode sense data, symbols, and semiotics could fulfill a literary gap in knowledge about advancing the enjoyment of life. According to Moustaskas (1994), qualitative analyses could detail the information and expand the latitude that a questionnaire restricts. Perhaps qualitatively studying the aesthetic experience within a virtual environment could measure aesthetic occurrence in symbolic cognition, immersion, and descriptive emotional responses. Knowing how art online makes for a compelling experience would be valuable. Studying emotional responses to art can awaken the senses to awareness as Langer (1953) refers to it as sense data, the affective conditioning of the senses for generating and deciphering human responses (Langer, 1957) and as symbolic transformation (Langer, 1979) from apathy to empathy that helps humans "…live more ardently in the world" (Greene, 1995b, para 31). Another endorsement for studying technology, especially post PC devices, and art came from Jobs, who proclaimed, "Technology alone is not enough. It's [sic] technology married with liberal arts, married with the humanities, that yields the results that make our hearts sing. Nowhere is that more true than in the post PC devices" (Jobs, 2011).

A psychological issue to research related to flow and technology is to observe whether humans prefer emotional elevations and engagement in technology to that of human relations. With the convergence of emotions and digital technologies (Serrano-Puche, 2015), psychologists might research how digital technologies such as smartphones channel emotions via a stimulus or are activated by imagination in a virtual space and might study the consequences to human relationships and communication, which is the

very realm of art. Psychologists might also experimentally measure for the distinction in motivations within flow as to whether the aesthetic experience is self-sustaining or autotelic in digitized humanities, consists of epistemic or metacognitive feelings, and if it is initiated by novelty or familiarity (Dokic, 2016).

Aesthetic research could also be conducted to determine whether technology mediates art better than seeing art in situ. Snapper, Orac, Hawley-Dolan, Nissel, & Winner (2015) previously researched whether viewers could distinguish whether an artist, a child, or an animal created art. Research could be conducted to determine viewers' preference for viewing art in technology or in situ. The study could ascertain whether certain technical features could profoundly present and highlight art creating greater sensory response than seeing it in person. For example, the lilies of a Monet are beautifully painted, but when spotlighted, the effect to water and sky is luminous and resplendent. Pixels, digital imaging of the picture elements in smart technology, could enhance the color clarity, sensory effect, and emotional response within the digital realm.

I made several recommendations for future studies. First, future studies could measure the neurological correlates of the emotional response when viewing artworks in a computer mediated environment (CME). This scientific confirmation furthers the existence of physiological and psychological benefits of the aesthetic experience. In the current study, my dependent variable was a consciously and explicitly self-reported value that attempted to quantify a subjective experience. However, the conscious act of reflecting on the experience for the purpose of choosing a score to report on the Likert scale can interfere with the experience itself, as reviewed above. Neurophysiological

measurements, in place of Likert-scale reports, could bypass this limitation by measuring a physiological correlate of the experience without requiring the participant to break the flow of the experience to report it. Such measurements would improve the fidelity with which the participant's report of a subjective experience approximates the actual experience.

Likewise, researching nonneural physiological correlates of this flow experience may be possible. For example, bioaestheticists could track eye movement when viewing art online to study patterns as they relate to known patterns involved in visual memory skills (Vogt & Magnussen, 2007). Because length of time spent looking at art is a factor in attaining the aesthetic experience (Locher, 2011), an online study determining the time spent looking at each digitized artwork or a specific artwork might yield more definitive, sophisticated statistical results. Replacing the self-report Likert responses with a dependent variable that does not require conscious reporting, but instead measures eye movements or other physiological variables, may also improve the fidelity with which the dependent variable reflects the subjective flow experience. Steier et al. (2015) measured how bodily positioning and movement mediated perception when looking at gallery art. A study could be conducted to investigate bodily gestures and proprioception when viewing art on a smartphone.

Other studies may quantify the intensity of explicit emotional recognition when looking at specific artworks. For example, the flow experience related to a certain piece of art may change more dramatically with other artworks. If so, making such measurements would advance understanding of how visual and nonverbal signals are

decoded by observers. In turn, this understanding would lead to insights into individual, organizational, and cultural behavior. Thus, future studies are needed to determine the role that specific works of art play in determining the intensity of the flow experience.

Future technology is projected to advance to smaller screens than the present smartphones, and future studies should expand to include these new technologies. For example, Apple's Watch may become the technology of the future and the communication technology for Generations X, Y, and Z. If this occurs, a similar study needs to be conducted to determine whether there is any emotional response to visual stimuli on a screen measuring 1.5 x 1.3 inches, the approximation of Apple's Watch. Presently, the technological evolution is advancing to viewing with ocular goggles and to complete immersion in a virtual reality. This new technology may present an opportunity for research about whether goggles may or may not enhance metamedium (McLuhan, 1964) and represents an opportunity for further research in the study of art appreciation and the viability of the aesthetic experience in virtual reality. Because smartphones are the prevailing technology and corporations like Sony's PlayStation and Nintendo are developing video game apps for smartphones, their investment underscores the belief that humans adapt to technology and are capable of focused engagement. With more research in aesthetic economics, the arts could be as interactive and engaging.

Another opportunity for a comparative study is to contrast the flow experience when using digital versus analog display media by presenting an artwork as an in situ representation, a replication in a publication, and a digital version to see if the response remains the same or is diminished in one medium over the others. Experience has shown

that some people are sorely disappointed with the *Mona Lisa* when they view it in person, while others are transfixed by it. The enigma is that some viewers may be enthralled with viewing the replication of an artwork in a book, have minimal responses after viewing the artwork in person, and still others may prefer the technological benefits of being able to zoom into the art for a closer view of the artist's brush strokes not possible when viewed in person. Questions arise about whether the medium is the message, what message do the various media transmit in real vs. virtual presentation; that is, could they be importance, immediacy, permanency, or evanescence. Identity factors motivate each medium.

In the area of studying explicitly aesthetics, aesthetics may become the remedy for the exaggerated life style resulting an overstimulated world. Art reflecting the complexities in the world is "Messethetics," the apparent direction of art according to Getty Museum's forecaster of visual trends, that art is becoming "messy, grimy, slimy, visceral, beautiful, and ugly" (Groosman, 2016, p. 58). Future research may be needed in helping find ways to procure balance in life that is found in art. Research may also be needed for finding balance as an element of the aesthetic experience. Art may become a "visual haiku" directing the balance in life to elegant simplicity. However, research would be needed to discover whether balance elevates the spirit or flattens it and engages or numbs responses.

Idealistically, researching phenomena that increase personal knowledge and contribute to humanity or develop skills is important. Researching art and technology is of psychological importance and individual well-being. From a more pragmatic

perspective, until art and technology become a “capitalist pleasure” (Moffat, 2005) like music, movies, and online games, and until they develop their own Internet market, minimal attention and study will be given art and technology. When aesthetics becomes integrated into education and life style, the *Encyclopedia of Cyber Behavior* (Yan, 2012), which includes 106 chapters with entire sections dedicated to cyber behavior and business, medicine, law, government, and education, may include a section on cyber behavior and aesthetics and the arts and their importance based on new research.

Implications for Practice

The results of this study showed that with a sufficient sample size, the change in aesthetic experience that accompanies a mobile app-based intervention can be measured and quantified. The results of this study also demonstrated that viewers had an aesthetic experience when viewing art on smartphones. If the enriching experience can be attained once, it can be realized exponentially and repeatedly to the betterment of the individual and society. This study’s main result invites people to change the way they see and consider the world. When art and technology merge, there is deeper immersion into virtual reality, creating more intense flow. As the world's artworks continue to be digitized, new digital tools will emerge that will allow people to develop a “culturomic browser” to explore the artworks, encouraging further cyberaesthetics that will lead to positive social, institutional, and individual change.

Positive Social Change Implications

Measuring the extent to which the aesthetic experience can occur in virtual environments is critical to society because society is increasingly enmeshed in the virtual world. Csikszentmihalyi and Robinson (1990) discovered that

> the aesthetic experience develops sensitivity to the *being* of other persons, to the excellence of form, to the style of distant historical periods, to the essence of unfamiliar civilizations. In so doing, it changes and expands the being of the viewer. (p. 183)

Experiencing art has a vital bearing on the survival of the human species, as art helps people examine their emotions and values and encounter human potential for transcendence, resulting in a desire to better humanity and to know and be their better selves.

With the ubiquity of smartphones, art and one's relationship with it determine the future. While art is egalitarian, digitized humanities can be the vehicle for democratizing all of society and opening eyes to cultures beyond, and making the world more humanitarian. Without the sketched rhinoceros of artist and printmaker Dürer and the prevailing technology of the 16th century, that is, the woodcut and the Gutenburg press, Europeans could not fathom the concept of an armored, powerful animal from a far off country. Likewise, with the depiction of soldiers blinded by nerve gas in World War I, *Gassed* by John Singer Sargent (Figure 3) and the atrocities in Picasso's *Guernica* (Figure 4), naivety about war is impossible. Thus, art is also part of memory that directs

humans to positive social change in showing them the past and present so they can design an improved future.

Figure 3. Gasssed. John Singer Sargent, 1919. Imperial War Museum, London.

Figure 4. Guernica. Pablo Picasso, 1937. Museo Reina Sophia, Madrid.

Within digital humanities, technology can deliver epiphanies as when art is viewed on a smartphone and the viewer's intelligence and emotions roam the "neural patterns of our mind" (Loprieato, 2014, p. 424), producing *aha* moments in explosive neuroaesthetics. Be they synchronous and asynchronous, digital humanities can encourage independence and collaboration and can create more global connectivity and reciprocity, making the area of art and technology worthy of future research. Art can

make use of technology "to grow, to expand, to discover new identities, new possibilities…and can provide an opportunity for the growth of knowledge" (Loprieato, 2014, p. 427). When technology extends vision, sight makes insight. Art makes people more caring because the resulting transcendence from viewing art lifts the spirits of all humankind and such elevation leads to altruistic behavior resulting in positive social change.

Implications for Individual Change

Through this study, I have verified for individuals another way of enjoying life. Humankind seems to seek transcendence for a variety of reasons and seems to achieve it with a wide variety of substances and behaviors: drugs, food, drinks, dancing, praying, participating in sports, playing chess, and viewing art. Because of the human need to transcend above the mundane, researchers have studied the flow theory in various contexts: schools (Admiraal et al.; Bakker, 2003), sports (Bakker et al., 2011; Dillon & Tait, 2000; Jackson & Marsh, 1996; Mugford, 2006; Rogatko, 2009; Schuler & Brunner, 2009); games (Fang et al., 2012; Liu & Chang, 2012; Soutter & Hitchens, 2016); music (Bakker, 2003; O'Neill, 1999); nursing (Ahern, 2005; Wardini et al., 2013); business (Fullagar & Kelloway, 2010; Koufaris, 2002; Nielsen & Cleal, 2010; Thaler & Tucker, 2012), and cyberbehavior (Barker, 2015; Eber, Betz, & Little, 2003; Finneran & Zhang, 2005; Gee, 2003; Liu, S. et al., 2009; Novak et al., 2000). A major purpose of such studies has been to operationalize and delineate the flow theory. The need is great for optimal enjoyment because it encourages "personal wholeness, a sense of discovery and a sense of human connectedness" (Csikszentmihalyi & Robinson, 1990, p. 178).

These lines of inquiry are critical because the individual ability to achieve a flow experience depends on one's proficiency in viewing art. The personal benefits of a rich aesthetic experience are limited if the viewer has only rudimentary perceptual skills. On the other hand, if viewers are willing to advance or deepen their understanding of the art genre, the historical and cultural implications, and the emotional and communicative possibilities of artworks, the experience becomes a more richly satisfying experience: an aesthetic experience. This willingness can come from many sources. Viewers are generally attracted to the formalities of colors or shapes as stimuli within an artwork and then they identify with emotional, biological references within the artwork. Later, viewers may relate intellectually to the science, math, or psychology within the object of interest. In any case, there is no correct order for viewing art and arriving at an engagement with an artwork, as some people may respond emotionally to the artwork and proceed into the historical dimensions of the period, and then be enthralled with the technical qualities and achievements of the artist. Because all approaches can contribute to transcendence, the number of individuals who can achieve this flow experience can be maximized by making art available by as many modes as possible, provided that the technology in question has the potential to engender that experience. Thus, technology furthers the independence of the viewer to pursue his or her interest in the process of engaging with the art.

Without the transcendence of the aesthetic experience in a cognitive, expressive, or technical encounter with art, the artwork is personally meaningless. Individuals suffer if the opportunities for viewing art diminish or vanish or if society makes no investment

in honing the skills for encoding and decoding art. In these cases, the experience of art will be shallow. When technology mediates engagement with art and is a medium in which cultural knowledge is produced and perpetuated, such results may produce psychological well-being. Once beauty is recognized, art makes people more caring about themselves, others, and the environment; these changes minimize suffering and promote well-being. Competencies in the narratives of the arts and attaining some level of virtuosity with the arts have been shown to correlate with personal happiness (Kubovy, 1999).

Individuals seek moments of awe. Such moments stem from complex emotions "characterized by feelings of intense pleasure, surprise, connectedness and vastness but also by feelings of fear and uncertainty" (van Elk, Karinen, Specker, Stamkou, & Baas, 2016, p. 4). Within Darwin's (1859/2009) evolutionary theory people learned that pleasure and pain are human motivators. According to Dutton (2009), beauty, as experienced by the organism, could be the reason the organism developed appendages and sensory apparatus. If the organism wanted to replicate the experience of beauty, one could say that art was the impetus for evolution (Dutton, 2009). If that is so, then for humankind to continue to evolve, artworks that reflect beauty and human experiences remain an evolutionary requisite. A world without art would be a world that no longer challenges parts of the mind, no longer inspires understanding, and stunts potential growth and development. In other words, the aesthetic experience changes and expands humankind. In the words of Csikszentmihaly and Robinson (1990), "The full exercise of mental capacities is in itself a source of aesthetic pleasure" (p. 57) and "Total

involvement in an aesthetic experience forces viewers to confront their emotions and values and provides a taste of sharing the essence of other beings, other ways of life" (p. 184).

Institutional Implications

Emerging technology changes the education paradigm and changes the conversation about how to conduct art education. Teaching skills for viewing artworks is a critical educational competency that provides insight into self, others, history, and the sciences. Viewing artworks requires some skills for interpreting content, as art is coding a visual message. Images, shapes, and colors are a part of iconography. To go deeper than mere looking at artworks in a museum "flyby" approach. The context of the artwork and the viewer's inner disposition must be such that together, they will engender an experience of engagement in the art to a point of aesthetic, emotional transcendence. To attain this, museums and educational institutions need to employ a new means of delivering the benefits of art. To this end, smartphones are a serious contender.

In this study, the paradigm of the flow theory was used in viewing art with technology, and the findings showed that participants adapted. As a result, it may be time for a shift in the approach to art education. The future of art education may be a shift away from dictating from the top down how to view art towards emphasizing the vast freedom of personal interpretation technology affords. This shift may in turn help eliminate achievement gaps in education and integrate art in interdisciplinary studies that advances a holistic approach to education and democratizes it further. For example, Darling Hammond (2010) maintained that two achievement gaps exist in American

education: the gap between White and affluent students and students of color and those in poverty. Technology employed in learning, now termed elearning, has the potential to narrow this gap. Therefore, the merger of art with technology can be a great social equalizer. The opportunity for an optimal experience becomes available to all. For example, imagine what will happen when an institution makes Edward Hopper's *Night Hawks* (Figure 5) available to all people at all hours; viewers will reflect on their own identity and on the collective unconscious that provides a portrait of Americans.

Figure 5. Nighthawks. Edward Hopper, 1942. Art Institute of Chicago. Chicago, Illinois.

Artworks could provide the context for interdisciplinary educational content. To that end, predictable advantages and challenges exist with the integration of art and technology in all institutions. For example, smartphones are ubiquitous and portable, yet ease of use can be a challenging issue, as can affordability and political constraints of accessibility. When art historians use a zoom feature, art works can be studied and

compared, as high-resolution images enhance the tiniest detail that transforms the art historian's experience and make unexpected connections and intellectual discoveries.

Art educators can use smartphone technology in structuring student inquiry. By extending digitized collections to inquiring minds otherwise limited by geography and economics, educators can fulfill their educational mission of providing access to art and enhancing student engagement with art. Once archives from around the world are fully digitized, art educators and researchers can extend visual culturomics. An N-gram program for art can be invented and used by students to verify and link artists' works and styles globally. Google Art Project has worked toward democratizing art as they photograph art in high resolution to be made available to all to explore art in extraordinary detail and for extending and availing art collections and art education. Virtual museums are a reality with traditional brick and mortar museums acting as the curators and vanguards of treasures and cultures.

Museum officials seek the best way to use technology to enhance art engagement. Technological innovations can enhance the delivery of art to interested viewers and can help ensure that museums do not become mortuaries of artworks but remain vibrant environments, beckoning viewers for exceptional and memorable experiences. Digital humanities will continue to provide self-study that results in the enhancement of personal reactions to art. Instead of the bombardment of verbal dialogue explaining an artwork, with digitized artworks, the viewer can explore and attain an individualized emotive embodied experience (Jones, 2016) that meets museum and art educators' objective.

To fulfill their missions, museums must meet the needs of millennials and the cohorts that follow. Today, 64% of American adults (Smith, 2015) and 85% of Americans ages 18-29 (Anderson, 2015) claim smartphone ownership, while at the same time museum attendance is down 6% annually (NEA, 2015). Thus, mobile technology is a natural vehicle through which to address declining interest in museums. This does not mean museums must house radical interactivity with their exhibits, but it does mean that museums can individualize tours and retain the valuable calm and haven appreciated by some visitors.

Museum practices are at an end of an era. Museums in the future will adopt a new paradigm focused on training visitors what a painting is about, rather than how to view it. Too often, people are trained how to see, or what or who is in the painting, rather than what is happening in the painting. The use of digital technology in art education expands the possibilities for instruction and exposure. However, these new opportunities come with additional requirements, such as to rigorously study what is needed to experience art in the digital world and optimizing where and how to look on a screen. Institutions are also more generally faced with the task of teaching how to have emotional awareness and cognitive responses under electronic conditions and teaching the art of perception. In so doing, suddenly for the museum viewer or student art is up front and personal, and the benefits of art are at one's fingertips.

Conclusions

The conclusions of this study go beyond the contributions made by previous studies that examined the relationship between aesthetic experience and technology. First,

this study contributes to the field by providing quantitative data about the aesthetic experience when viewing art within technology, whereas most previous studies had been qualitative only. Second, the current study brings the field up to date with recent changes in the fast-evolving field of technology by conducting the study on smartphones rather than desktop computers. Third, in terms of art education theory, this study expands the educational setting to anywhere and anytime a smartphone is used. Finally, in comparison to previous studies of the relationship between aesthetic experience and technology, this study broadened the population of interest to everyday people, not just those already educated in the arts such as museum professionals and art history students, making the theories presented historically in this field relevant to a much larger group of people who will ultimately benefit from their elaboration.

The results of this quantitative study provided the answer to the question of whether humans can achieve an aesthetic experience when viewing art on smartphones. In particular, the study results confirm that by using a mobile technology platform, everyday people, not just museum professionals and art students, can achieve an aesthetic experience from art, even in the absence of the physical works of art. Furthermore, the findings provide a quantitative framework (in conjunction with the AEQF) for future studies to examine in detail the dimensions and intensity of the experience. The significant results indicated that viewing art in a computer-mediated environment of a smartphone could be an avenue to the optimal experience of flow, the aesthetic experience. The information from this research will be useful to museum staff and art educators as they seek to extend the transcending enjoyment of art and the knowledge,

perception, and communication that the medium delivers, beyond the confines of buildings. This research is a preliminary step toward the discovery of what technological device is best, how viewers can best interact with this technology, and which art is best displayed in the digital medium, all of which remain to be studied. While future researchers discover answers, virtual art may provide a foundation for digital humanities and cyber culture. However, the aesthetic experience itself contributes to a sense of discovery and an allure towards universal appreciation that leads to positive social change.

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Appendix A: Aesthetic Experience Questionnaire Form

Date_____, 2015

Aesthetic Experience Questionnaire Form

Part A Circle or fill in the requested information.

Initials or Number

Sex: M F Circle Age: 21-30 31-40 41-50 51-60 61-70 71-85

Work Field

_____

Field of study or major in education

_____

Level of education: high school some college undergraduate graduate

There are no "right" or "wrong" answers to the questions that follow: They are designed to reflect your subjective perceptions and responses. The questionnaire should take only a few minutes to fill out and to submit electronically when finished.
Please use your zoom capabilities as part of a process for interpreting and appreciating art and having an aesthetic experience.

First, take the pretest. Second, view the app. Third, take the posttest.

Part B

The following items refer specifically to "aesthetic experiences" that come about as a result of encounters with artworks—however broadly defined.

Which of the items below are true, and which are not true of such experience?

The choices are:

	Never True	Occasionally True	Sometimes True	Often True	Always True
1. The pieces that have some sort of a challenge are the	□	□	□	□	□

ones that stay in your mind.

2. I trust my own personal opinion and preferences.	□	□	□	□	□
3. Sooner or later I get to know mostly what the artist means to convey in the work.	□	□	□	□	□
4. My knowledge and training are kept out of the aesthetic experience.	□	□	□	□	□
5. Art is the affirmation of concrete reality and should not be aiming at any "higher" order or experience.	□	□	□	□	□
6. After I have a reaction to an art object, it is important to be able to check my first impression through further "tests."	□	□	□	□	□
7. In approaching a work of art, I never set some goal or objective I wish to achieve through the experience.	□	□	□	□	□
8. After thirty seconds' worth of looking, I have absorbed what it has given me.	□	□	□	□	□
9. Feelings have no place in my encounter with the art object.	□	□	□	□	□
10. Art gives a sort of transcendent experience that takes you out of the realm of everyday life.	□	□	□	□	□
11. I am often afraid of not	□	□	□	□	□

making the right response.

12. The final word is never said. A good painting will never be used up.	□	□	□	□	□
13. The purely visual qualities of an art object are relatively trivial and have little impact on the aesthetic experience.	□	□	□	□	□
14. In the course of the aesthetic experience, it is difficult to know whether one's thoughts or feelings are relevant to the work encountered.	□	□	□	□	□
15. I have a rather clear idea of what to do when approaching a work of art.	□	□	□	□	□

Part C

Please indicate the extent of your agree or disagreement with the opinions about art listed below.

	Never True	Occasionally True	Sometimes True	Often True	Always True
1. You can get so filled up with knowledge that you don't have time for a genuine response to the work.	□	□	□	□	□
2. The object must contain the inherent beauty created by the artist.	□	□	□	□	□
3. In the best works of art, you get a sense of order, of everything coming together in a new or different way.	□	□	□	□	□

4. It is sufficient for me to respond with emotional feelings to a work of art to satisfy my appetite for beauty.	□	□	□	□	□
5. A great work of art represents the ferment and energy of a whole age.	□	□	□	□	□
6. The more information you bring to a work of art, the more interesting it's going to be.	□	□	□	□	□
7. Great art can be appreciated simply along a visual dimension; knowledge and feelings sometimes get in the way of the experience.	□	□	□	□	□
8. Art must be made by people, because the communication of human experience is an essential aspect of the aesthetic encounter.	□	□	□	□	□
9. I don't need to be confronted with a new way of seeing or of understanding the world in order to have an aesthetic experience.	□	□	□	□	□
10. Art objects seem to reach out and grab me; the aesthetic experience sometimes takes my breath away.	□	□	□	□	□
11. The quality of execution, the look and finish of the materials, are extremely important in determining my response to the work.	□	□	□	□	□
12. The works of art I like do	□	□	□	□	□

not necessarily stimulate an emotional response in me.

13. Dealing with art is no different than dealing with any other commodity. □ □ □ □ □

14. A great work of art helps the viewers share the sensibilities of people from other ages, other places. □ □ □ □ □

15. Formal qualities, like balance or harmony, are often irrelevant to the quality of the work of art. □ □ □ □ □

16. Knowledge of the historical and biographical background of a painting, generally enhances the quality of the aesthetic experience. □ □ □ □ □

17. Art works help one to connect different ideas, different feelings, that hadn't been brought together before. □ □ □ □ □

Part D

Please rank the three items from the list of 17 items above that most closely reflect your opinion about the aesthetic experience.

Rank #1 Item #
(Agrees most strongly)

Rank #2 Item #

Rank #3 Item #

Check one: Did you review the art on an iPhone iPad Computer

Additional comments:

Appendix B: Email Granting Permission to use Aesthetic Experience Questionnaire Form

Carol Ikard <carol@ikard.com> Jul 14

to **pubinfo**

From: Carol Ikard <carol.ikard@waldenu.edu>
Date: Monday, July 14, 2014 2:29 PM
To: Mihaly Csikszentmihalyi <mihaly.csikszentmihalyi@cgu.edu>
Subject: Permission request

Hello

I am a PhD candidate with Walden University writing my dissertation, *Contemporary Visual Arts: The Influence of a Mobile Application on Art Appreciation,* and would like to use Mihaly Csikszentmihalyi and Rick Robinson's Aesthetic Experience Questionnaire Form, published in *The Art of Seeing: An Interpretation of the Aesthetic Encounter (1990).* I will be using the survey in quantitative research, specifically for a pretest and posttest assessment.

My research relates to a mobile application, generic tutorial in art appreciation of non-liberal arts educated participants to determine to what extent there is a change in perspective and experience after the intervention of a tutorial.

Additionally and with your permission, I would like to change a few words in the survey.

Page	Original wording:	Requested changes
193	Highest Degree Earned:	Educational level:
193	Please return it in the stamped and addressed envelope we have attached.	Please click “Submit” when completed.
194	Sooner or later I get to know exactly what the artist…	[Omit the word “exactly”]
197	…the aesthetic experience sometimes is like being hit in the stomach.	…the aesthetic experience takes my breath away.

Thank you for these considerations.

Sincerely,

Carol Ikard

PhD Candidate

The Richard W. Riley College of Education

Walden University

(512) 784-5651

carol.ikard@waldenu.edu

Mihaly Csikszentmihalyi <Mihaly.Csikszentmihalyi@cgu.edu> Jul 15

to me

Sure, go ahead.

Mihaly Csikszentmihalyi
Distinguished Professor
of Psychology and Management
Claremont Graduate University
1227 N. Dartmouth Ave.
Claremont, CA, 91711

Appendix C: Art and Smartphones Pre and Posttest

Art and Smartphones

CONSENT FORM

You are invited to take part in a research study about art and the aesthetic experience. This study is gathering information about viewing art on a smartphone. Adults, age 18 or older, with minimal or average understanding of art are participants in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a doctoral researcher, Carol Ikard, a student at Walden University.

Background Information:
The purpose of this study is to study your response to viewing a variety of art.

Procedures:
If you agree to be in this study, you will be asked to:
- Use a smartphone (iPhone or Android), to take a questionnaire, view a variety of art, and then take another questionnaire all in one sitting.
- The process could take 25-45 minutes depending on how you like to enjoy art.

Here are some sample questions:

	Never True	Occasionally True	Sometimes True	Often True	Always True
1. In the best works of art, you get a sense of order, of everything coming together in a new or different way.	□	□	□	□	□
1. The pieces that have some sort of a challenge are the ones that stay in your mind.	□	□	□	□	□

Voluntary Nature of the Study:
This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time. The study is totally online and totally anonymous.

Risks and Benefits of Being in the Study:
Being in this study would not pose risk to your safety or wellbeing.

The study's potential benefits include an enjoyable review of art that may produce information for museums and art educators to use or apply regarding viewing art online.

Payment:
There is no financial gain or loss for participating, but gratitude for advancing educational research in the visual arts.

Privacy:
Any information you provide will be kept confidential and anonymous through the completion of the survey and the study. The researcher will not use your personal information for any purposes outside of this research project. Also, the researcher will not include your name or anything else that could identify you in the study reports. Data will be kept secure by PsychData, a recognized online survey company that will use numeric codes, "Responsdent ID Numbers" in place of names. After completion of the research as indicated by the researcher, PsychData will retain the data for 7 days before permanently deleting the data from their backup system. The doctoral researcher will retain the data for a period of at least 5 years, as required by the university, before destroying the data.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via carol.ikard@waldenu.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 612-312-1210. Walden University's approval number for this study is **01-19-16-013954** and it expires on **January 18, 2017**.

Please print or save this consent form for your records.

Obtaining Your Consent

If you have read and understand the above statements, please indicate your consent by clicking on the "Continue" button.

——————————————————Page Break——————————————————

Aesthetic Experience Questionnaire Form

Complete the following demographic questions.

1)
Sex:

○ M ○ F

2)
Age:

18-20 21-30 31-40 41-50 51-60 61-65+

3)
Work Field:

4)
Field of study or major in education:

5)
Level of education:

high school some college undergraduate graduate

———————————————————Page Break———————————————————

There are no "right" or "wrong" answers to the questions that follow: They are designed to reflect your subjective perceptions and responses. The questionnaire should take only a few minutes to fill out.

The following items refer specifically to "aesthetic experiences" that come about as a result of encounters with artworks—however broadly defined.

Which of the items below are true, and which are not true of such experience?

The choices are:

Never True, Occasionally True, Sometimes True, Often True and Always True

Answer the following questions:

		Never True	Occasionally True	Sometimes True	Often True	Always True
6)	1. The pieces that have some sort of a challenge are the ones that stay in your mind.					
7)	2. I trust my own personal opinion and preferences.					

8)	3. Sooner or later I get to know mostly what the artist means to convey in the work.					
9)	4. My Knowledge and training are kept out of the aesthetic experience.					
10)	5. Art is the affirmation of concrete reality and should not be aiming at any "higher" order or experience.					
11)	6. After I have a reaction to an art object, it is important to be able to check my first impression through further "tests."					
12)	7. In approaching a work of art, I never set some goal or objective I wish to achieve through the experience.					
13)	8. After thirty seconds' worth of looking, I have absorbed what it has given me.					
14)	9. Feelings have no place in my encounter with the art object.					

		Never True	Occasionally True	Sometimes True	Often True	Always True
15)	10. Art gives a sort of transcendent experience that takes you out of the the realm of everyday life.					
16)	11. I am often afraid of not making the right response.					
17)	12. The final word is never said. A good painting will never be used up.					
18)	13. The purely visual qualities of an art object are relatively trivial and have little impact on the aesthetic experience.					
19)	14. In the course of the aesthetic experience, it is difficult to know whether one's thoughts or feelings are relevant to the work encountered.					
20)	15. I have a rather clear idea of what to do when approaching a work of art.					

——————————————————————Page Break——————————————————————

Please indicate the extent of your agreement or disagreement with the opinions about art listed below.

		Never True	Occasionally True	Sometimes True	Often True	Always True
21)	1. You can get so filled up with					

knowledge that you don't have time for a genuine response to the work.

22) 2. The object must contain the inherent beauty created by the artist.

23) 3. In the best works of art, you get a sense of order, of everything coming together in a new or different way.

24) 4. It is sufficient for me to respond with emotional feelings to a work of art to satisfy my appetite for beauty.

25) 5. A great work of art represents the ferment and energy of a whole age.

26) 6. The more information you bring to a work of art, the more interesting it's going to be.

27) 7. Great art can be appreciated simply along a visual dimension; knowledge and feelings sometimes get in the way of the experience.

28) 8. Art must be made by people, because the communication of human experience is an essential aspect of the aesthetic encounter.

29) 9. In don't need to be confronted with a new way of seeing or of understanding the world in order to have an aesthetic experience.

		Never True	**Occasionally True**	**Sometimes True**	**Often True**	**Always True**
30)	10. Art objects seem to reach out and grab me; the aesthetic experience sometimes takes my breath away.					
31)	11. The quality of execution, the look and finish of the materials, are extremely important in determining my response to the work.					
32)	12. The works of art I like do not necessarily stimulate an emotional response in me.					
33)	13. Dealing with art is no different than dealing with any other commodity.					
34)	14. A great work of art helps the viewers share the sensibilities of people from other ages, other places.					
35)	15. Formal qualities, like balance or harmony, are often irrelevant to the quality of the work of art.					

36)	16. Knowledge of the historical and biographical background of a painting, generally enhances the quality of the aesthetic experience.	◯	◯	◯	◯	◯
37)	17. Art works help one to connect different ideas, different feelings, that hadn't been brought together before.	◯	◯	◯	◯	◯

——————————————————Page Break——————————————————

Below you will see a Respondent ID number. **Please copy this number down or take a screen shot.** You will need it to answer the first Post-Test question.

[Unique Respondent ID Number]

Your unique Respondent ID# is: [value will appear here]

(Print this page)

[Random Stimulus Assignment 1]

Please read all of the following instructions carefully before continuing.

- Click on the Glasswall link below to view the artwork.
- The Glasswall website will open in a new window.
- **Keep PsychData open.** You will need to return to this page after viewing the artwork.
- When you are done viewing the artwork, return to this page and click **Continue**.

www.Glasswall.mobi

[Random Stimulus Assignment 2]

Please read all of the following instructions carefully before continuing.

- Click on the Glasswall link below to view the artwork.
- The Glasswall website will open in a new window.
- **Keep PsychData open.** You will need to return to this page after viewing the artwork.
- When you are done viewing the artwork, return to this page and click **Continue**.

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[End of Survey]

————————————————————Automatic Page Break————————————————————

[Change the "Survey Title" Setting?]

Art and Smartphones

[Change the "Respondent ID" Setting?]

Your unique Respondent ID# is: 0

(Print this page)

PREVIEW MODE: Responses will NOT be stored.

Art and Smartphones - Post test

Please enter the Respondent ID number that you were given in the Pretest survey.

The following items refer specifically to “aesthetic experiences” that come about as a result of encounters with artworks—however broadly defined. There are no "right" or "wrong" answers.

Which of the items below are true, and which are not true of such experience?

The choices are:

Never True, Occasionally True, Sometimes True, Often True and Always True

	Never True	Occasionally True	Sometimes True	Often True	Always True
1. The pieces that have some sort of a challenge are the ones that stay in your mind.	○	○	○	○	○
2. I trust my own personal opinion and preferences.	○	○	○	○	○
3. Sooner or later I get to know mostly what the artist means to convey in the work.	○	○	○	○	○
4. My Knowledge and training are kept out of the aesthetic experience.	○	○	○	○	○
5. Art is the affirmation of concrete reality and should not be aiming at any "higher" order or experience.	○	○	○	○	○
6. After I have a reaction to an art object, it is important to be able to check my first impression through further "tests."	○	○	○	○	○
7. In approaching a work of art, I never set some goal or objective I wish to achieve through the experience.	○	○	○	○	○
8. After thirty seconds' worth of looking, I have absorbed what it has given me.	○	○	○	○	○
9. Feelings have no place in my encounter with the art object.	○	○	○	○	○
	Never True	**Occasionally True**	**Sometimes True**	**Often True**	**Always True**

10. Art gives a sort of transcendent experience that takes you out of the the realm of everyday life.	○	○	○	○	○
11. I am often afraid of not making the right response.	○	○	○	○	○
12. The final word is never said. A good painting will never be used up.	○	○	○	○	○
13. The purely visual qualities of an art object are relatively trivial and have little impact on the aesthetic experience.	○	○	○	○	○
14. In the course of the aesthetic experience, it is difficult to know whether one's thoughts or feelings are relevant to the work encountered.	○	○	○	○	○
15. I have a rather clear idea of what to do when approaching a work of art.	○	○	○	○	○

Continue ONLY when finished. You will be unable to return or change your answers.

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Please indicate the extent of your agreement or disagreement with the opinions about art listed below.

	Never True	**Occasionally True**	**Sometimes True**	**Often True**	**Always True**
1. You can get so filled up with knowledge that you don't have time for a genuine response to the work.	○	○	○	○	○
2. The object must contain the inherent beauty created by the artist.	○	○	○	○	○
3. In the best works of art, you get a sense of order, of everything coming together in a new or different way.	○	○	○	○	○
4. It is sufficient for me to respond with emotional feelings to a work of art to satisfy my appetite for beauty.	○	○	○	○	○

5. A great work of art represents the ferment and energy of a whole age.	○	○	○	○	○
6. The more information you bring to a work of art, the more interesting it's going to be.	○	○	○	○	○
7. Great art can be appreciated simply along a visual dimension; knowledge and feelings sometimes get in the way of the experience.	○	○	○	○	○
8. Art must be made by people, because the communication of human experience is an essential aspect of the aesthetic encounter.	○	○	○	○	○
9. In don't need to be confronted with a new way of seeing or of understanding the world in order to have an aesthetic experience.	○	○	○	○	○

	Never True	**Occasionally True**	**Sometimes True**	**Often True**	**Always True**
10. Art objects seem to reach out and grab me; the aesthetic experience sometimes takes my breath away.	○	○	○	○	○
11. The quality of execution, the look and finish of the materials, are extremely important in determining my response to the work.	○	○	○	○	○
12. The works of art I like do not necessarily stimulate an emotional response in me.	○	○	○	○	○
13. Dealing with art is no different than dealing with any other commodity.	○	○	○	○	○
14. A great work of art helps the viewers share the sensibilities of people from other ages, other places.	○	○	○	○	○
15. Formal qualities, like balance or harmony, are often irrelevant to the quality of the work of art.	○	○	○	○	○
16. Knowledge of the historical and biographical background of a painting, generally enhances the quality of the aesthetic experience.	○	○	○	○	○
17. Art works help one to connect different ideas, different feelings, that hadn't been brought together before.	○	○	○	○	○

Please rank the three items from the list of 17 items above that most closely reflect your opinion about the aesthetic experience.

Rank #1 - Agrees most strongly Item # (from 17 questions above)

Fill in **Item #** (question number 1-17 above)

Rank #1

Rank #2

Rank #3

Select one: Did you review the art on an

iPhone/ cellphone iPad/ tablet Computer (laptop or desktop)

Additional comments:

(1000 characters remaining)

Continue ONLY when finished. You will be unable to return or change your answers.

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Thank you!

[Automatic Text]

For maximum confidentiality, please close this window.

PREVIEW MODE: Responses will NOT be stored.