ENTHUSIASTIC EDUCATORS AND INTERESTED VISITORS: INVESTIGATING THE RELATIONSHIPS BETWEEN MUSEUM EDUCATORS’ ENTHUSIASM AND VISITORS’ SITUATIONAL INTEREST

by

ChangChia James Liu

A Dissertation

Submitted to the Faculty of Purdue University

In Partial Fulfillment of the Requirements for the degree of

Doctor of Philosophy in Educational Psychology

Department of Educational Studies
West Lafayette, Indiana

August 2018
THE PURDUE UNIVERSITY GRADUATE SCHOOL
STATEMENT OF COMMITTEE APPROVAL

Dr. P. Youli Mantzicopoulos, Chair
Department of Educational Studies

Dr. Helen Patrick
Department of Educational Studies

Dr. Yukiko Maeda
Department of Educational Studies

Dr. Gerald H. Krockover
Department of Curriculum and Instruction

Approved by:

Dr. F. Richard Olenchak
Head of the Graduate Program
In Dedication to Merry, Peggy, Celia, and Furball
ACKNOWLEDGMENTS

The author would like to thank the staff at the Department of Educational Studies and Graduate School Office for their exceptional administrative assistance during preparation for graduation. The author would also like to thank Dr. Youli Mantzicopoulos, Dr. Patrick Helen, Dr. Yukiko Maeda, and Dr. Gerald H. Krockover for their guidance and advises throughout this project. In addition, this work would not be as fun and memorable without supports from Maryam Ghadiri and Inok Ahn, and this long journey would not even be possible without encouragement and love from my families.
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ABSTRACT

Author: Liu, ChangChia, J. PhD
Institution: Purdue University
Degree Received: August 2018
Title: Enthusiastic Educators and Interested Visitors: Investigating the Relationships between Museum Educators’ Enthusiasm and Visitors’ Situational Interest
Major Professor: P. Youli Mantzicopoulos

Informal education environments like museums have become some of the most important educational resources. Although much attention has been paid to museum settings and programs, little is known about how museum educators support visitors’ learning and intrinsic motivation. In particular, there is a need to investigate museum educators’ enthusiasm, considering that enthusiasm is a powerful way of creating an engaging learning experience across various subjects and environments. In this study, I investigate museum educators’ enthusiasm as perceived by adult visitors through the lens of interest development. The results I found (N = 209) indicate a strong positive relationship between museum educators’ enthusiasm and visitors’ situational interest. Visitors’ reports of educators’ enthusiasm were directly related to catch interest (β = .74) and indirectly to hold interest (β = .46). In addition, educators’ enthusiasm mediated the connection between prior individual interest and catch interest. Visitors’ prior individual interest was also moderately related to both their catch (β = .28) and hold interest (β = .37). Limitations and directions for future studies are discussed.
CHAPTER 1. INTRODUCTION

In the past thirty years, a substantial body of research on museum education has emerged indicating the complex educational outcomes of museum visits, especially in the field of science, technology, engineering, and mathematics (STEM) (Bell, Lewenstein, Shouse, & Feder, 2009; Falk & Dierking, 1992; 2000; Phipps, 2010). Studies have shown that visiting museums and other informal learning environments benefits students’ learning and increases children’s, families’, and communities’ understanding of various subjects (e.g., Ash, 2003; Bamberger & Tal, 2007; Falk & Needham, 2011; Paris, Yambor, & Packard, 1998; see Bitgood, 1989, and DeWitt & Storksdieck, 2008, for reviews of field trips). It is clear that museums serve as important sites of informal education in today’s society (Falk et al., 2015).

Recent research into museum education has expanded its focus from visitors’ knowledge gains to a much broader view of visitors’ museum experiences (Bell et al., 2009). Specifically, in addition to examining conceptual changes, studies have examined visitors’ affect and motivation, including attitudes, interest, and intrinsic motivation; together, these outcomes are considered important educational benefits and outcomes of museum visits (Dohn, 2011; Sample McMeeking, Weinberg, Boyd, & Balgopal, 2016; Zimmerman, Land, & Jung, 2016).

In particular, a small but growing literature is focused on visitors’ interest as a crucial outcome of museum experiences: visiting museums is a powerful way to support visitors’ interest (Bell et al., 2009; DeWitt & Storksdieck, 2008; Falk, Pattison, Meier, Bibas, & Livingston, 2018). Researchers have identified several individual and contextual factors that may influence visitors’ interest, including their prior knowledge and interests, program structures (e.g., workstation and hands-on activities), learning materials (e.g., worksheets), exhibits and displays (e.g., live animals), and social interactions (e.g., parent-child conversations) (Dohn,
2011; Falk & Storksdieck, 2005; McClain & Zimmerman, 2014; Palmquist & Crowley, 2007; Wilde & Urhahne, 2008). Together, these findings highlight the value of museum visits in enhancing visitors’ interest.

Although much attention has been paid to the programs and physical settings of museums, little is known about museum educators and their impact upon visitors’ experiences (Allen & Crowley, 2014; Ash, Lombana, & Alcala, 2012; Castle, 2001; Tran, 2008; Zeller, 1984). The term “museum educator” usually refers to the paid staff and unpaid volunteers who share educational responsibilities and interact face-to-face with visitors in museums (Tran, 2007). Their tasks typically include (a) leading tours and educational programs, (b) answering questions and providing information, and (c) conducting demonstrations or live performances (e.g., storytelling). They also indirectly shape visitors’ learning experience by (a) developing exhibitions and educational programs, (b) implementing programs and events, and (c) conducting visitor studies and evaluations (Tran & King, 2007). However, despite their critical roles and responsibilities, little research has focused specifically on museum educators’ practices and teaching due to the lacks of well-accepted professional preparation and practices and to the complexity of tasks across informal contexts (Tran & King, 2007). Therefore, it remains unclear what and how museum educators contribute to visitors’ learning and interest.

Given the settings and environments of the museum settings, one approach to investigating museum educators’ impact is in the context of social interaction, particularly the enthusiasm they convey when, in their instructional roles, they interact with visitors about exhibits or programs. Educator enthusiasm, also known as teacher enthusiasm, is widely considered to be an instructional strategy that includes expressive and energetic teaching behaviors (Patrick, Hisley, & Kempler, 2000). Research conducted in formal education settings
has shown that teachers’ enthusiasm is moderately and positively associated with students’ achievement, learning attitudes, interest, and intrinsic motivation (Bettencourt et al., 1983; Collins, 1978; Keller et al., 2014; Patrick et al., 2000). By expressing their passion, enjoyment, and engagement in teaching, enthusiastic teachers create contagious emotions and motivation in the classroom, sharing the importance and value of learning with their students, and as a result creating a learning environment that promotes intrinsic motivation (Kunter et al., 2008). Just as teachers support students in classrooms, museum educators may support visitors’ interest development by sharing their enthusiasm about specific topics and exhibits while leading tours or hosting programs. By expressing their passion and enthusiasm, museum educators can create an engaging learning environment when interacting with visitors. This context has the potential to affect not only visitors’ learning but also their interest in the content of the museum exhibit. However, the association between educators’ enthusiasm on visitors’ interest has been understudied. This study aims to fill this gap.

Specifically, the objectives of this research are to (a) investigate whether or not visitors perceive museum educators’ enthusiasm in informal settings, and (b) examine the relationship between visitors’ perceived enthusiasm and interest. The following sections first review research on interest and educator enthusiasm, and then provide the overview of the current study.

**Interest**

Interest is an important motivation construct that has been widely studied in education research. Interest is closely associated with student achievement, attention, memory, goals, level of learning, and other desirable educational outcomes (Ainley, Hidi, & Berndorff, 2002; Cordova & Lepper, 1996; Mitchell, 1993; Pintrich, 2003; Renninger & Wozniak, 1985; Renninger, Hidi, & Krapp, 2015; Schiefele, 1991, 2009). Interest can be generally defined as an enduring tendency to engage with a particular subject or activity over time (Hidi & Renninger, 2006).
When a person has an interest in photography, for example, he or she is likely to engage in activities related to photography (e.g., taking photographs or reading books about photography) and to enjoy those activities. Interest evolves and is sustained by the interactions between a person and his or her environment, and contextual factors of that environment (e.g., family support; Frenzel, Goetz, Pekrun, & Watt, 2010) contribute greatly to the direction and strength of interest development.

Studies and theories of interest differentiate between two types of interest, situational and individual (Hidi & Renninger, 2006; Schiefele, 2009). Situational interest is a temporary psychological state triggered by environmental stimuli and characterized by focused attention, intensive cognitive functioning, positive affect, and high curiosity (Rotgans & Schmidt, 2011). Individual interest (or personal interest) is a more enduring, self-generated individual disposition to be attracted to, to engage with, and to enjoy certain activities, topics, or objects (Hidi & Renninger, 2006; Pintrich, 2003; Schiefele, 2009). Early studies have indicated that both situational and individual interest relate to learning and cognitive functioning, such as attention and memory (Cordova & Lepper, 1996; Renninger & Wozniak, 1985). Research has also shown that both situational and individual interest are closely related to important motivation constructs such as goals, intrinsic motivation, and values (Krapp, 2005; Pintrich, 2003; Renninger & Hidi, 2011; Wigfield & Cambria, 2010). Hidi and Renninger (2006) further proposed a four-phase model of interest development, suggesting that interest develops sequentially, from situational to individual interest, by gaining affect, value, and knowledge of an interest through four different stages: triggered situational interest, maintained situational interest, emerging individual interest, and well-developed individual interest.
Triggered situational interest and maintained situational interest (also known as catch and hold interest, respectively) are the two different forms of situational interest (Mitchell, 1993; Hidi & Renninger, 2006). Catch interest describes the arousal of a person’s attention for a short period of time by external factors, such as affect, novelty, surprises, and personally relevant information. Hold interest features the psychological state of interest that involves focused attention and persistence over an extended episode in time by the meaningfulness of tasks and/or personal involvement (Hidi & Renninger, 2006). In Mitchell’s (1993) study, for example, students’ interest was caught by activities that involved puzzles and computer use (which was novel at the time). After students’ interest was caught, in order to prolong it—in other words, to hold their interest—Mitchell indicated that it was important to provide students with meaningful information related to the subject and to encourage active participation in the learning process over an extended period of time.

After repeated exposure to and engagement with the subject over time, situational interest may transform into individual interest. Individual interest develops in different phases, including “emerging individual interest” and “well-developed individual interest” (Hidi & Renninger, 2006). In both of these phases, interest is characterized as a “relatively enduring predisposition to seek repeated reengagement with particular classes of content over time” (p. 114). The difference between the two phases lies in the quality of content-related knowledge, values, and affective involvement. Hidi and Renninger (2006) have argued that people with well-developed interest in a subject have more knowledge of the subject and value the content more than people with emerging individual interest. People with well-developed interest are also more likely to use meta-cognitive strategies, such as self-regulation, to reengage or persist in activities when facing challenges, than people with emergent individual interest.
Besides the sequential progression of interest development, research has also suggested a reciprocal and interactive relationship between situational interest and individual interest. Durik and Harackiewicz (2007), for instance, have indicated that students with different levels of individual interest in mathematics responded differently to stimuli that triggered situational interest in mathematics-related events. Situational factors designed to “catch” students’ interest, such as colorful pages, only affected students who had low individual interest. However, the stimulus designed to “hold” students’ interest yielded an opposite result. The study suggested that students’ individual interest moderates the relationship between contextual factors and situational interest (Durik & Harackiewicz, 2007). A recent study also indicated that individual interest consistently explained a quarter to one third of variance of repeatedly measured situational interest across multiple events (Knogler et al., 2015). This highlighted both the interaction between individual and situational interest and the progression of this interaction.

Relationships and interactions between situational and individual interest are particularly important in museum education because visitors often have different levels of interest in and knowledge of the exhibition’s subject. Visitors with well-developed interest may experience and learn differently from visitors with no prior interest in the subject. As a result, the design of an exhibition may appeal to some visitors but not to others. For example, Falk and Adelman (2003) found that not only did visitors’ interest in the subject of an exhibition (e.g., wildlife conservation) increase after visiting an aquarium, but the increase depended on visitors’ prior knowledge of and interest in the subject. By categorizing visitors based on their prior interest and knowledge level (minimal, moderate, and extensive), they found that two groups of individuals—a) individuals with minimal prior knowledge and minimal or moderate prior
interest, and b) individuals with moderate prior knowledge and minimal or moderate prior interest—showed significant gains in their level of interest.

Despite the important connection between visitors’ individual and situational interest, only a small number of museum studies have specifically addressed or differentiated the two. Early museum studies often lacked a theoretically driven and empirically validated instrument to assess visitors’ interest, making it challenging to compare and synthesize findings. For example, when studying visitors’ learning and interest at a science center exhibition, Falk and Storksdieck (2005) used two items in their survey to assess visitors’ interest: “Is there a topic(s) in biology you find particularly interesting?” and “On a scale of 1 to 6, how would you rate your interested topics in Biology?” (p. 773). Although the items may have good face validity, it is unclear whether the measurement captured the effect of the visitors’ museum experience on their situational interest or whether it was reporting visitors’ prior individual interest. The authors also did not provide a specific conceptualization or framework of interest in the study.

Recently, an increasing number of researchers have begun to adopt established motivation frameworks in their museum studies (Zimmerman, Land, & Jung, 2016). For instance, using the four-phase model of interest development, Zimmerman et al. (2010) investigated how parents prolonged and sustained children’s engagement in activities in museums to support children’s situational interests. In a qualitative study, Dohn (2011) used a sociocultural approach to indicate factors that elicited high school students’ situational interest during a field trip to an aquarium, such as their prior knowledge, social involvement, and hands-on activities. By constructing their studies based on existing motivation theories, the researchers were able to leverage previous research to investigate important factors that may influence
students’ situational and individual interest, such as authentic learning, social interaction, autonomy support, and self-efficacy.

Guided by recent motivation research, the present study addressed the shortcomings of previous museum education research on visitors’ interest. Specifically, this study looks at museum educators’ enthusiasm and, using the four-phase model of interest development (Hidi & Renninger, 2006), investigates its relationships with visitors’ situational and individual interest.

**Educator Enthusiasm**

Primarily examined in classroom contexts, educator enthusiasm is generally viewed as a set of behaviors and strategies that help engage students in learning. Studies have indicated that educator enthusiasm is positively associated with various student learning outcomes, such as achievement, on-task behaviors, learning attitude, and intrinsic motivation (Bettencourt et al., 1983; Brigham, Scruggs, & Mastropieri, 1992; Collins, 1978; Keller et al., 2014; Mastin, 1963; Patrick et al., 2000). As a result, educator enthusiasm has been used as a tool to evaluate teacher effectiveness and implemented in professional training programs for teachers to improve their teaching quality (Evertson et al., 1980; Marsh, 1984, 2007; Nussbaum, 1992; Rosenshine, 1970).

Traditionally, educator enthusiasm describes a style of teaching that is lively, dynamic, and active. It is marked by behaviors that include expressiveness, gestures, body language, and energy level. For example, Stewart (1989) described teachers with high enthusiasm:

The more enthusiastic lecture involved standing in front of the table or podium and moving about the front of the room, maintaining almost consistent eye contact with students, speaking with varied tone, volume, and rate at or above the normal 150 wpm, smiling often, using frequent gestures for emphasis and illustration, and using numerous qualifiers, examples, and stories. (p. 86).
These indicators, based on nonverbal expressiveness (e.g., eye contact), were often used in experiments to create different levels of educator enthusiasm in order to study the impact of educator enthusiasm (e.g., high- versus low-enthusiasm teachers’ impacts on students’ learning attitudes). Some studies used more general behaviors to identify educator enthusiasm, including energy level, relaxed presentation style, teacher-student interactions, and humor (Rosenshine, 1970). Both types of indicators focus on an educator’s observable behaviors related to the way they provide instructions or interact with students, and they both define and operationalize educator enthusiasm (Keller et al., 2016; Rosenshine, 1970).

In recent years, the concept of educator enthusiasm has evolved with the development of education theories and practices. Currently, researchers focus on re-conceptualizing educator enthusiasm as an affective construct, not just a set of teaching behaviors, in order to understand (a) why some teachers are more enthusiastic than others, and (b) how teachers recognize or identify themselves as enthusiastic teachers. The answers to these questions help connect educator enthusiasm with other motivation constructs, such as teachers’ interest, goals, and self-efficacy, and provide a better understanding of teachers’ teaching experiences and well-being (Keller, 2011; Keller et al., 2016; Kunter et al., 2008, 2011). For example, Stipek and colleagues (2001) described mathematics teachers’ enthusiasm as the expression of their self-confidence and enjoyment of teaching mathematics, in which teachers “appeared to enjoy mathematics and showed interest and personal engagement with the task” (p. 219). Kunter et al. (2008) proposed that “enthusiasm can be conceptualized as a relatively stable affective disposition that may be seen as an integral part of teachers’ motivation” (p. 468). They further divided educator enthusiasm into two dimensions: teaching enthusiasm (i.e., the sentiment “I always enjoy teaching students new things”) and subject enthusiasm (i.e., “I am enthusiastic about
mathematics”), and they suggested that the two dimensions are distinct variables and moderately correlated with teachers’ working experiences (e.g., job satisfaction). Although more empirical studies are needed to conceptually and practically distinguish between the two dimensions and to relate them to other motivation constructs (e.g., interest), similar to Kunter et al., many researchers have described educator enthusiasm as an educator’s positive emotional experience during teaching that is expressed in teaching behaviors and observed by students (Frenzel et al., 2009; Keller et al., 2014 & 2016; Kim & Schallert, 2014; Lazarides et al., 2018; Mahler et al., 2017). Therefore, in this study, educator enthusiasm was conceptualized as an affective construct that represents the positive emotion and enjoyment that educators experience during their teaching (Frenzel et al., 2009; Keller et al., 2016).

Notably, although researchers are still in the process of defining educator enthusiasm, students seem to have little difficulty perceiving a teacher’s enthusiasm or differentiating between enthusiastic and non-enthusiastic teachers. Using items such as, “Our teacher teaches with enthusiasm” (Frenzel et al., 2009) and “Our teacher is an enthusiastic teacher” (Kunter et al., 2008), studies report that students’ perception of educator enthusiasm has high internal consistency reliability (i.e., Cronbach’s alpha) among items in assessment. Researchers also used low-inference indicators (e.g., facial expression) to manipulate educator enthusiasm and found that students could (a) successfully perceive differences in teachers’ surface features of enthusiasm, and (b) infer deep features of enthusiasm from these differences (e.g., teachers’ enjoyment in teaching; Patrick et al., 2000). In other words, students can infer whether their teachers are enthusiastic from observable teaching behaviors, such as those described in Stewart’s (1989) study. Studies have also shown that students’ reports of teacher enthusiasm are positively correlated with teachers’ self-reported enthusiasm (constructed as affect toward
teaching, Kunter et al., 2011). Although more empirical studies are needed to explain how the two are connected (e.g., what behavioral indications or reasoning students use to judge teacher enthusiasm), current evidence indicates that students can easily and reliably perceive educator enthusiasm and that it is positively related to teacher-reported enthusiasm.

Furthermore, studies also reported that educator enthusiasm and student intrinsic motivation are positively correlated. In general, students are more likely to be interested in learning and enjoy the lesson when teachers are more enthusiastic. Patrick and colleagues (2000) found that among various teacher variables (e.g., caring for students, knowledge of subject, and promoting student involvement), enthusiasm is the strongest predictor of student intrinsic motivation. In a follow-up study, the researchers created two experimental conditions (high vs. low level of educator enthusiasm) and found that students in the high educator enthusiasm condition reported higher intrinsic motivation than students in the low educator enthusiasm condition, suggesting a causal relationship between educator enthusiasm and student intrinsic motivation. The authors argued that “enthusiasm may contribute to an atmosphere of energy and electricity in the classroom and may forge a valuable pathway to a student’s interest in and excitement about learning” (p. 232). They contend that educator enthusiasm may be an “effective means for beginning to mobilize interest, excitement, and curiosity” (p. 233). Frenzel and colleagues (2009) indicated that educator- and student-reported enjoyment are positively correlated, and that the relationship is mediated by educator enthusiasm. They proposed that educators’ enjoyment and positive emotions are transmitted to students through activities and interactions and result in students’ enjoyment. Through the process of emotional contagion (Pekrun, 2006), students come to understand the value and meaning of tasks from educators’ enjoyment of a subject or the act of learning.
Following the same process, museum educators can support visitors’ intrinsic motivation via their enthusiasm. When leading a tour, for example, a museum educator’s enthusiasm can generate an atmosphere of excitement and enjoyment, and create an engaging and fun social learning environment for visitors, just as a teacher’s enthusiasm does for students in a classroom. The central idea is that museum educators’ enthusiasm is the way to convey his or her excitement and enjoyment to the audience, and as a result fosters the audience’s intrinsic motivation.

Educator enthusiasm may be especially important in museum settings because it can be perceived by the audience in a relatively short amount of time. For example, a study found that even during a short lecture (e.g., seven minutes), undergraduate students could successfully perceive and differentiate a guest instructor’s level of enthusiasm (Patrick et al., 2000). Similarly, visitors could perceive museum educators’ enthusiasm easily and rapidly. Given that visitors may interact with museum educators in various situations during their visits (e.g., a short conversation on museum floors, a 30-minute guided tour, a hands-on workshop, etc.), the museum educators’ enthusiasm could be one of the few ways to reliably create an exciting and motivating learning environment for visitors across different settings.

In addition, museum educators may also shape visitors’ learning experience through visitors’ perception of their enthusiasm. Studies have shown that students’ perception of teachers’ motivation may contribute to their learning experience and intrinsic motivation. Wild and colleagues (1992) designed an experiment to investigate the impact of students’ perception of their teacher as extrinsically or intrinsically motivated. Using a double-blind experimental design, they randomly assigned students to two identical piano lessons: in one condition, students believed their piano teacher was paid (extrinsic), and in the other they believed the
teacher was volunteering (intrinsic). The results showed that students in the volunteering condition enjoyed playing piano more, had more positive affect, were more likely to pursue future learning, and engaged in more exploratory play than students in the paid condition. Furthermore, students in the volunteering condition also believed their teacher was more interested in playing piano, enjoyed teaching more during the lesson, and was more innovative and spontaneous than students in the paid condition believed their teacher to be. The study suggested that “independently of teaching activities per se, learner perceptions of the constraining or no constraining nature of teacher’s motivation are sufficient to affect enjoyment of learning and the value affixed to learning” (p. 250). Since many museum educators are volunteers (e.g., docents) who are enthusiastic and intrinsically motivated in teaching and promoting visitors’ interest (Tran, 2007), their enthusiasm perceived by visitors may affect visitors’ intrinsic motivation as well as learning outcomes.

Together, these studies provide strong evidence of the relationships between students’ intrinsic motivation and their perception of educator enthusiasm. The studies also highlighted the effectiveness and efficiency of educator enthusiasm, which can be perceived in a relatively short period of time. However, the relationship between educator enthusiasm and visitors’ intrinsic motivation has not been examined in the museum settings. It is unknown that whether or not visitors can perceive museum educators’ enthusiasm as students perceive teachers’, and whether or not the perceived enthusiasm is related to visitors’ situational and individual interest.

**Current Study**

The goal of this study is to investigate the relationship between visitors’ interest and museum educators’ enthusiasm for teaching (EFT). Based on the four-phase model of interest development (Hidi & Renninger, 2006), the visitors’ individual interest includes three elements—affect, value, and knowledge—while situational interest consists of two domains:
catch and hold interest. The catch domain focuses on visitors’ attention and affect, and the hold domain deals with the value and meaningfulness of tasks and with persistent involvement in activities related to the interest. Educator enthusiasm is conceptualized as an educator’s affective experience in teaching, including such experiences as enjoyment and excitement (Keller et al., 2016; Kunter et al., 2008). Both museum educators’ self-reported enthusiasm and visitor-perceived enthusiasm of museum educators were measured. The study uses a structural equation modeling framework to investigate the following three hypotheses about the relationships (Figure 1):

1. The two forms of visitors’ situational interest, catch and hold, are correlated (H1).

2. Visitors’ situational interest (catch and hold interest) is correlated with visitors’ prior individual interest (H2a & H2b)

3. Visitors’ situational interest (catch and hold interest) is correlated with perceived enthusiasm in the museum educator (H3a & H3b).

4. Visitors’ individual interest is correlated with perceived enthusiasm in the museum educator (H4).
Figure 1. The hypothesized structure of the research model.
CHAPTER 2. METHOD

Site and Tour Selection

The study took place during a single exhibition at a cultural and historical museum in a metropolitan area in the North East region. The museum had a long-term exhibition about the history of Chinese immigration from the seventeenth century to the present day, featuring historical artifacts, oral history (via multimedia such as photographs and videos), and a recreation of an eighteenth-century general store. More than 200 artifacts and photographs were in this exhibition, including several interactive displays (e.g., audio that played when a visitor stood in a particular location). Museum tours were guided by educators in the typical dialogic structure, in which museum educators lead visitors through multiple displays in the museum and provide information by answering inquiries and engaging in conversation. Using this tour format benefits the research design of this study by controlling factors that have been indicated to be strongly related to visitors’ situational interest, including the structure of a tour (visitor-centered or guide-centered), program activities (e.g., hands-on activities), and the attractiveness of displays (e.g., live animals and touch screens; Basten, Meyer-Ahrens, Fries, & Wilde, 2014; DeWitt & Storksdieck, 2008; Dohn, 2011; Falk & Adelman, 2003; Henderlong & Paris, 1996). The tour was free with general museum admission. It took approximately one hour and participation was not required for general visitors.

Participants

Visitors. The participants were general adult museum visitors (18 years old or older) who joined the guided tour led by museum educators during the study period. In seven months of recruitment, 305 adult visitors were approached by the author and 288 visitors provided informed consent. Sixty-eight participants who did not finish all the surveys (including pre- and post-tour
surveys) and 11 participants who provided low-quality data (e.g., responses were all 4 or 7 on the scale, outliers, and missing data) were excluded from the dataset. The final dataset included 209 participants ($N = 209$, 66% female, mean age = 25.93 years old, $SD = 10.62$; response rate = 68.52%). Approximately 36.8% of participants had a college degree, and 46.9% had undergraduate or graduate degrees. Caucasian and Asian participants each composed 38.8% of the participants. All participants were able to speak and read English, and 48% spoke at least one other language. With regard to the context of their visits, 78% of the participants joined booked tours arranged prior to their visits, and 47% came with their friends or classmates or with class field trips (e.g., undergraduate students who had signed up for a summer course that required exploring three cultural institutions). Approximately 62% of participants had passes for admission (e.g., CityPASS) or pre-paid group admission and did not pay for admission on site. In terms of their museum-going pattern, 44% of participants visited a museum once every couple of months, and 28.7% of the participants visited a museum once a year or less. The size of the tour groups ranged from 2 to 30 people, and the size sometimes varied during the tour because visitors were free to join or leave the tour at any given time.

**Museum educators.** The museum educators leading this tour were paid staff (full- and part-time) who shared a broad range of responsibilities related to educational services, including tours, lectures, and family programs. The museum provides training sessions and learning materials for new educators to lead tours, and has continuous weekly training sessions (e.g., shadowing) and meetings to support and improve museum educators’ teaching ability and skills. All museum educators (four females and one male, mean age = 30.8 years old, $SD = 7.12$) participated in the study. The educators had different educational backgrounds, including museum studies, literature, art history, and history. They also had different years of teaching
experience in formal education (e.g., as a teacher) or in informal education (e.g., as a museum educator) (mean of teaching experience in museums = 2.5 years, $SD = 3.56$). All the museum educators had been teaching in the current museum for at least one year.

**Instruments**

The surveys included in this study are listed in the appendix with both original and modified questionnaires, items, and reliabilities (e.g., Cronbach’s alphas). The surveys were piloted with a small set of additional participants ($n = 10$) to test participants’ comprehension of the items prior to the study.

**Visitor pre-tour survey.** The visitor pre-tour survey asked for visitors’ demographic and visiting information, and their prior individual interest (PII) in the subject of the tour (see Appendix A and C for the items). The PII questionnaire was adapted from Harackiewicz et al.’s (2008) questionnaires and based on Hidi and Renninger’s (2006) four-phase model of interest development. The PII questionnaire included three sub-dimensions: affect, value, and knowledge. Affect is a positive feeling toward and enjoyment of the subject of the interest (e.g., “I’m excited about the tour”; four items). Value refers to the importance of the subject (e.g., “I think the history of Chinese immigration is an important topic”; three items). Knowledge refers to knowledge related to the context of the interest (e.g., “I have little knowledge of the history of Chinese immigration”; three items). The 10 items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree), and the questionnaire reached good internal reliabilities (Cronbach’s $\alpha = .90$ for original questionnaire, and $\alpha = .76$ in the current study).

**Visitor post-tour survey.** The post-tour survey was a set of questionnaires given to participants after the tour. The survey aimed to capture a variety of constructs of visitors’ tour experiences. The constructs included situational interest, perceived enthusiasm in museum educators, attractiveness of displays, engagement quality of the tour, and facilitation toward
interest development (see Appendix D, E, G, H, & I, respectively, for the original and modified items). The details of each questionnaire are listed below, as well as the reliabilities of the questionnaires. All items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree).

**Situational interest (SI; Appendix D)**. The SI questionnaire was adapted from Knogler et al.’s (2015) questionnaire. It included two sub-dimensions of situational interest, catch (six items) and hold (six items). Based on the four-phase model of interest development, the catch dimension is designed to assess the first stage of interest development, which involves attention and affect (e.g., “The tour captured my attention”). The hold dimension is designed to assess the second phase of interest development, in which situational interest is sustained by acquiring the knowledge, value, and meaningfulness of the subject as well as continual involvement in related tasks (e.g., “I find the topics of the tour useful”). Knogler et al. (2015) reported Cronbach’s alphas of 0.90 and 0.88 for catch and hold, respectively (α = .78 and .88, respectively, in the current study).

**Visitor-perceived enthusiasm (VPE; Appendix E)**. The VPE questionnaire was adapted from Frenzel et al.’s (2009) study, in which students (seventh and eighth grade) used four high-inference items to measure deep feature enthusiasm in their teachers (Cronbach’s α = .85), seeing educator enthusiasm as an affective construct. In the current study, the wording of the items was changed to fit the content of the tour (i.e., immigration history), and the questionnaire included four items of high-inference indicators that refer to deep feature enthusiasm, and four items of low-inference indicators that refer to surface feature enthusiasm (Rosenshine, 1970). An example of high-inference items is “Our tour guide seemed to take pleasure in talking about the history of Chinese American and immigration.” An example of a low-inference item is “Our tour guide
used many gestures.” In the current study, Cronbach’s alpha was .84 for deep-feature enthusiasm and .51 for surface-feature enthusiasm.

**Attractiveness of displays (AOD; Appendix G).** The AOD questionnaire was designed to assess the general attractiveness of the exhibits in the tours. The questionnaire was adapted from Durik and Harackiewicz’s study (2007), in which the appeal of a technique notebook was used to catch students’ situational interest. In this study, the questionnaire was modified by changing the wording to fit the context of the tour (i.e., immigration history). The questionnaire included four items, such as “The display of the exhibition caught my attention” (Cronbach’s α = .73 in current study).

**Engagement quality (EQ; Appendix H).** The questionnaire was designed to assess visitors’ perception of their interaction with museum educators. As previously discussed, a museum educator’s instruction is an important contextual factor for facilitating visitors’ intrinsic motivation (Csikszentmihaly & Hermanson, 1995; Tran & King, 2007). Thus, it is important to know how visitors perceive the quality of museum educators’ instructions, and how that may be related to their situational interest. An example statement is “I think our tour guide tried to involve everyone during the tour” (Cronbach’s α = .69 in current study). The questionnaire included four items.

**Facilitation of interest development (FID; Appendix I).** The FID questionnaire, designed to capture current process of developing individual interest, assessed the feature of emerging and well-developed interests with six items. These questions captured visitors’ intention to facilitate their individual interest, such as seeking and valuing future opportunities to reengage in tasks and activities related to the subject (Cronbach’s α = .85, in current study).
**Museum educator survey.** The museum educator survey collected museum educators’ background information as well as their working experience in the fields of museums and education. The survey also collected information about their self-reported enthusiasm about teaching and leading tours. The *Museum educator self-reported enthusiasm* (MESRE; Appendix F) questionnaire was adapted from Kunter et al.’s study (2011). They reported a Cronbach’s alpha of 0.85. The MESRE questionnaire contains six items (e.g., “I always enjoy teaching visitors new things”).

**Procedure**

The museum educators were recruited before their tours (see Appendix J). They met with the author individually to complete the museum educator survey and scheduled days for data collection, which were the days when the educators gave their tours. On the day of data collection, the author recruited visitors approximately 15 to 20 minutes prior to the tour. During this time, visitors were gathering at the entrance to the gallery of the exhibition. Visitors who provided informed consent (see Appendix K) then filled out the pre-tour survey. The museum educator started the tour after the pre-tour surveys were collected. The tour took approximately one hour. At the end of the tour, participants filled out the post-tour survey. The surveys were paper-based and each took approximately five to ten minutes to complete.

**Data Analysis**

Descriptive statistics were first conducted to summarize the data. Multivariate analysis of variance (MANOVA) was used to test whether or not visitors’ grouping variables were related to multiple continuous dependent variables measured in the study. The analysis included visitors’ prior individual interest—affect, value, and knowledge—and all outcome variables in the post-tour survey: situational interest (catch and hold), perceived enthusiasm, engagement quality, attractiveness of displays, and facilitation of interest development. The characteristics of
participants included gender, age, ethnicity, education level, occupation (student), language ability (bilingual), personal connection with the museum or the subject matter (immigration), and museum-going pattern. The contextual factors included (a) the museum educator who led the tour, (b) whether the visit was a school field trip, (c) whether the tour was booked ahead, and (d) whether the participant paid for admission. One-way MANOVA was first conducted for each independent variable with all dependent variables. Multidirectional MANOVA was then tested for factors that had significant results from one-way MANOVA.

Structural equation modeling (SEM) was used to analyze the relationships among the constructs (see Figure 1). SEM combines the strength of factor analysis and multi-level regression analysis to analyze the structure of relationships among observed variables and latent constructs (Teo, Tsai, & Yang, 2013). SEM not only provides a hypothesis-testing approach in the analysis, but also lays out the multivariate relations among variables and estimations of both the direct and indirect effects of the variables. The software STATA (v.15.1) was used for the analysis.

Data Screening

Several steps were taken before conducting SEM analysis. The preliminary data analyses focused on issues including sample size, missing data, normality, outliers, and multicollinearity. Reliability and confirmatory factor analyses were also conducted to examine whether the constructs were reliably measured by the modified questionnaire items. The procedure and results of the screening are as follows.

Sample size. Although there is no consensus regarding how large a sample size is required in a given model, suggestions are provided in the SEM literature (e.g., Kline, 2005; Raykov & Widaman, 1995; Schreiber, Nora, Stage, Barlow, & King, 2006). For example, some researchers posited 100 participants as a minimum sample size, and considered over 200
participants to be a large sample size (In’Nami & Koiumi, 2013). The common approach is to determine the sample size based on the number of parameters estimated in a given model. Kline (2005) suggested that 10 to 20 participants for each parameter is sufficient for estimation. In addition, the requisite number of participants may increase depending on the complexity of the model as well as the quality of the data. If the variables are not normally distributed, for example, the number of participants may need to be increased to minimize the impact of sampling issues (Teo et al., 2013). The sample size in this study is slightly over 200 participants, which met the general minimum requirement suggested by SEM researchers. However, this number is not sufficient to estimate all variables included in the surveys at once. Therefore, the models tested in this study were restricted to include only three to four variables in each model in order to maintain, or at least approximate, the 1:10 ratio between estimated parameters and participants.

**Missing data.** The missing data issue in this study can be divided into two levels. The first level involves missing a substantial portion of pre- or post-tour surveys; the second level is missing responses on individual items in a given survey. For participants who did not complete the pre-tour survey, the main reason was that they were not able to finish the survey before the tour started because of logistical reasons such as coming in late or using the bathroom. This included 10.07% of all participants. Meanwhile, 13.54% of participants did not complete the entire post-tour survey. These were participants who filled out the pre-tour survey but did not complete the post-tour survey. Several factors may be involved. First, many visitors did not have time to complete the post-tour survey. Some tours were more than an hour long, and some visitors needed to leave the museum after the tour, especially tourists and student groups who often had limited time. Additionally, some tours ended around lunch or dinner time (e.g., 12 pm
or 5 pm) so visitors who had lunch or dinner plans could not stay for the post-tour survey. Most of these visitors explicitly informed the author of their reasons for not being able to complete the survey. Second, some visitors were distracted by other exhibitions in the museum at the end of the tour. These visitors went directly into other galleries/exhibitions after the tour and did not want to be distracted by filling out the survey when approached by the author. Some of these visitors were approached by the author before they left the museum. They were asked to focus only on their tour experience of the long-term exhibition without reflecting on the other parts of the museum. However, only a small number of participants were willing to complete the survey at that point. Given that those who did complete the post-tour survey after exploring other parts of the museum represented only a very small portion of the whole sample, their data were not separated or categorized differently from the whole dataset. Finally, it is possible that some visitors may have intentionally refused or did not have the patience to fill out the survey. This may be because visitors were tired after the tour, because the post-tour survey was too long for them, or because they had negative experiences during the tour. However, only limited evidence was available to explain their disinclination to complete the post-tour survey.

The second level of missing data is missing data from individual items in pre- and post-survey. Two participants were removed from the dataset due to missing responses in more than five items. Several participants missed one or two items in their surveys but there was no noticeable pattern in this missing data. Therefore, their missing data are treated as missing at random, and presumed to have no impact on estimation methods that use listwise or pairwise deletion or imputation (Allison, 2003).

**Normality and outliers.** Two aspects of data normality were considered in the SEM analysis: univariate normality and multivariate normality. The former refers to each variable’s
own normal distribution, and the latter refers to the normal distribution of each variable in relation to other variables or dimensions (In’Nami & Koiumi, 2013). Both univariate and multivariate normality are requisite assumptions in several SEM estimation methods such as maximum likelihood (ML), and violations of the assumptions may affect the accuracy of estimations and statistical tests.

Table 1. Tests of univariate normality and multivariate normality.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Kolmogorov-Smirnov</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Affect</td>
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<td>209</td>
</tr>
<tr>
<td>Value</td>
<td>.150</td>
<td>209</td>
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<tr>
<td>Knowledge</td>
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<td>209</td>
</tr>
<tr>
<td>Catch</td>
<td>.101</td>
<td>209</td>
</tr>
<tr>
<td>Hold</td>
<td>.119</td>
<td>209</td>
</tr>
<tr>
<td>Perceived Enthusiasm (Deep-feature)</td>
<td>.210</td>
<td>209</td>
</tr>
<tr>
<td>Perceived Enthusiasm (Surface-feature)</td>
<td>.078</td>
<td>209</td>
</tr>
<tr>
<td>Engagement Quality</td>
<td>.171</td>
<td>209</td>
</tr>
<tr>
<td>Attractiveness of Displays</td>
<td>.137</td>
<td>209</td>
</tr>
<tr>
<td>Facilitation of Interest Development</td>
<td>.124</td>
<td>209</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Mardia’s Coefficient</th>
<th>$\chi^2$</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-tour survey variables$^a$</td>
<td>Skewness</td>
<td>2.129</td>
<td>75.767</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Kurtosis</td>
<td>18.302</td>
<td>18.992</td>
<td>1</td>
</tr>
<tr>
<td>Post-tour survey variables$^b$</td>
<td>Skewness</td>
<td>11.964</td>
<td>424.451</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Kurtosis</td>
<td>74.120</td>
<td>371.317</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. $^a$The variables included affect, value, and knowledge. $^b$The variables included catch, hold, perceived-enthusiasm (deep), EQ, AOD, and FID.

Two indicators were used to measure univariate normality: skewness and kurtosis. Studies suggested that distributions with skewness and kurtosis exceeding 3 and 20, respectively (Kline, 2005; or 2 and 7, suggested by Curran, West, & Finch, 1996) are considered extremely
non-normal. Two tests were available to test univariate normality: the Kolmogorov-Smirnova test and the Shapiro-Wilk test (Razali & Wah, 2011). The multivariate normality is often examined by Mardia’s coefficient of multivariate skewness and kurtosis (Cain, Zhang, & Yuan, 2016). The results of the univariate normality test and Mardia’s coefficient test of multivariate normality are listed in Table 1. Although most observed variables did not exceed the suggested threshold for univariate normality, the test results were significant for both univariate and multivariate normality tests, indicating that the data were not normally distributed.

The outliers were tested using the SPSS boxplot with 3 interquartile range (IQR) as the criterion. Participants who had outliers in three or more items were removed from the dataset (four participants). For participants who had outliers in less than three items, these outliers were replaced by the next highest or lowest value of that variable (e.g., from 1 to 2, or 7 to 6), which included four participants on three different items.

**Multicollinearity.** In linear multiple regression models and SEM, multicollinearity refers to the condition in which two or more measured variables are highly correlated. This situation may not only cause redundancy in the dataset, but may also affect the estimated coefficient of the variables and result in biased statistical tests (e.g., increasing Type II error). The common rule of thumb for identifying multicollinearity is to compute correlations of variables of the model or construct. The pair of variables that reach a correlation higher than \( r = .80 \) is considered to have potential multicollinearity, and higher than \( r = .95 \) is considered to have extremely high multicollinearity (Grewal, Cote, & Baumgartner, 2004). Based on these criteria, the variable FID in the post-survey, which is highly correlated with Hold (\( r = .91 \)), was excluded from model estimations. On the item level, item Catch2 in the post-survey, which is highly correlated with Catch1 (\( r = .82 \)), was also excluded from further analysis.
**Model estimation and methods.** Given that most of the data were not normally distributed, which violated the assumption of the maximum likelihood method, the asymptotic distribution-free (ADF; Jones & Waller, 2015) method was selected for estimation of both CFA and SEM. The ADF method is free from the requirement of the assumption of normality for either observed or latent variables (Browne, 1984; Jones & Waller, 2015).

For model fits, several indexes were included to measure the fitness of the models. The indexes included the Tucker-Lewis index (TLI), comparative fit index (CFI), standardized root mean residual (SRMR), and root mean square error of approximation (RMSEA). There are various suggestions for cutoff criteria of the indexes, and the general rules for a good fit include RMSEA < .06 to .08, SRMR ≤ .08, CFI ≥ .95, TLI ≥ .95, and non-significant results from the Chi-square test (Schreiber et al., 2006).

**Reliability and confirmatory factor analysis (CFA).** For prior individual interest (PII), the initial reliability test yielded a high reliability on the construct of affect (α = .81) but low reliability on the construct of value (α = .57) and knowledge (α = .54). The correlations of the items of value indicated that one item was weakly aligned with the other two value items. By excluding the item, the reliability of the remaining two items increased (α = .77). Similarly, one item used to measure knowledge was poorly correlated with the other two knowledge items. The reliability of the two items was slightly higher (α = .66) comparing to that of three items. The Spearmen-Brown coefficient (Eisinga, Te Grotenhuis, & Pelzer, 2013) for value and knowledge were .77 and .66, respectively, similar to the results from Cronbach’s alpha. Therefore, by excluding the poorly correlated items, the α level of both constructs improved.

For affect, the four items were parceled into two groups by randomly sorting items into two pairs and averaging the two items in each pair. This was done to maintain a similar ratio of
the number of items in each sub-construct after removing the items described above. The ratio of
the number of affect, value, and knowledge items was 4:3:3 in Harackiewicz et al.’s study, and
excluding the items in value and knowledge resulted in a changed ratio of 4:2:2, which shifted
the weight of affect in estimating participants’ prior individual interest. By parceling the affect
items, the ratio became 2:2:2, which is closer to the original questionnaire. In addition, the
psychometric benefits of parceling include increasing reliability, reducing violation of
distributional assumptions, increasing intervals between scale points, and reducing the number of
parameters in structural models (Little, Cunningham, Shahar, & Widaman, 2002). The parcel can
be applied when the construct is well-defined and previously tested, especially when the focus of
the study is to model effects and relationships among latent variables. Even though it is common
practice to have a limited number of items because of resource constraints and the removal of
poor items, using only two items to estimate an underlying construct may be problematic in some
studies (Eisinga et al., 2013; Little, Lindenberger, & Nesselroade, 1999). Yet, given that the
construct and questionnaire regarding individual interest are based on empirical research, in
which the validity and reliability of the items were already established, it is reasonable to make
these modifications to reflect the characteristics of the museum visitors in the sample.

Given the changes of the items, a CFA was conducted to test the model fit of the new
structure of PII. The result indicated a good model fit of one latent variable as individual interest
loaded by the six items, $\chi^2(7) = 4.75, p = .69$, RMSEA = 0.00, CFI = 1.00, TLI = 1.00, SRMR =
.02, $\alpha = .76$. This single latent variable structure of individual interest is similar to Harackiewicz
and colleagues’ (2008) study, in which interest was constructed by initial interest and previous
knowledge ($\alpha = .90$). As a result, the construct of individual interest in this study consisted of
two affect (parceled), two value, and two knowledge items under a single latent variable, individual interest.

For situational interest (SI), both catch and hold items yielded good reliability ($\alpha = .78$ and .88, respectively). The two latent variables structure also indicated a good model fit, $\chi^2(33) = 39.71, p = .20$, RMSEA = .031, CFI = .94, TLI = .92, SRMR = .11. For engagement quality (EQ) and facilitation of interest development (FID), the Cronbach’s alphas were .69 and .85. Both constructs yielded a good fit on the single factor construct, EQ: $\chi^2(1) = .56, p = .46$, CFI = 1.00, TLI = 1.00, RMSEA = .00, SRMR = .02; FID: $\chi^2(8) = 10.26, p = .25$, CFI = .97, TLI = .94, RMSEA = .04, SRMR = .05. For attractiveness of display (AOD), the initial Cronbach’s alpha was low ($\alpha = .59$). The correlations among items indicated that Item 2 (“The exhibition displays were dull”) was poorly correlated with the other three items. It is possible that the item was difficult to understand for some participants who were English language learners. For example, several participants did not understand the meaning of the word “dull” and asked their friends or the author for an explanation. Upon removing the item, the reliability improved ($\alpha = .72$) and the single latent factor structure showed a good model fit, $\chi^2(3) = 49.44, p < .001$, RMSEA = .00, CFI = 1.00, TLI = 1.00, SRMR = .00.

For visitor-perceived enthusiasm (VPE), the deep feature enthusiasm had a good reliability and model fit for one latent variable structure loaded by four items ($\alpha = .84$, $\chi^2(1) = .53, p = .47$, CFI = 1.00, TLI = 1.00, RMSEA = .00, SRMR = .01). However, the surface feature enthusiasm was not well-measured in the survey. Not only was the Cronbach’s alpha level low ($\alpha = .51$), but the correlation matrix also showed low corrections among the items (mean $r = .23$, $SD = .15$, range = .06 to .42). It seemed that visitors did not make connections between the behavioral indicators (e.g., hand gestures or moving around) and the museum educators’
enthusiasm. Several factors may explain this result. First, it is possible that the museum settings or the tour environment prohibited these behaviors at times. For example, museum educators may not have been able to move around since some exhibition areas were limited in space, especially with a large group of visitors; or they may have avoided hand gestures due to the materials they were holding during tours such as clipboards and handouts. Second, there is a potential ceiling effect with regard to visitors’ perceived enthusiasm. Visitors may have perceived museum educators’ enthusiasm at the beginning of the tour, and paid little attention to the indicators later during the tour. This is evidenced by the fact that visitors did perceive the deep feature enthusiasm in museum educators (average of deep level enthusiasm = 6.43, SD = .85). In other words, the visitors perceived museum educators’ enthusiasm, but did not connect it with the behaviors described in the questionnaire. Last but not least, given that there were only five museum educators in the study, the individual differences in how they expressed their enthusiasm may have contributed to this result. Cultural differences may also play a role in shaping how visitors perceived museum educators’ enthusiasm or how museum educators expressed their enthusiasm. In sum, the data indicated that the items did not consistently measure visitor-perceived surface-feature enthusiasm, even though they were developed based on previous research on educator enthusiasm. Therefore, the construct of perceived surface feature enthusiasm was excluded from further data analysis.
CHAPTER 3. RESULTS

Descriptive Statistics

The descriptive statistics of the measured outcomes are listed in Table 2. Overall, the participants showed high prior individual interest ($M = 5.29, SD = .96$) before the tour, and high situational interest after the tour ($M = 5.88$ and $5.93, SD = .85$ and .89, for catch and hold, respectively). They also reported perceiving the museum educators as highly enthusiastic ($M = 6.44, SD = .64$), considering the displays of the exhibition attractive ($M = 5.91, SD = .86$), and finding the tour experience engaging ($M = 6.33, SD = .64$). Among the three sub-constructs of prior individual interest, the result of the non-parametric alternative one-way ANOVA with repeated measures (Friedman test) indicated that the distribution of the scores of the three sub-constructs were different, $\chi^2(2) = 141.12, p < .001$. Post hoc analysis using Wilcoxon signed-rank test further indicated that there were significant differences between affect and value, affect and knowledge, and value and knowledge ($Z = -5.39$, $Z = 10.08$ and $Z = 10.90$, respectively; all $p < .001$), showing that participants had a higher score in recognizing the value of immigration history than in having positive affect or knowledge of the subject. Most of the scores were negatively skewed and had a positive kurtosis, indicating that participant feedback was overwhelmingly positive (see Table 2). The overall high means and low standard deviation also indicated the restriction of range across these variables, especially perceived enthusiasm (deep feature). This restricted range suggested that the observed variations and correlations of the variables were attenuated and that the estimated coefficient of the variables may have been underestimated, resulting in constrained and biased statistical tests (e.g., Type II error).

The correlation matrix is presented in Table 3. The examination of the correlations indicated that prior individual interest is positively, significantly ($p < .01$), and moderate
Table 2. Descriptive statistics and internal consistency of measures.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior Individual Interest</td>
<td>209</td>
<td>5.29</td>
<td>0.96</td>
<td>2</td>
<td>7</td>
<td>-0.35</td>
<td>0.11</td>
<td>0.76</td>
</tr>
<tr>
<td>Affect</td>
<td>209</td>
<td>5.57</td>
<td>1.06</td>
<td>2.5</td>
<td>7</td>
<td>-0.63</td>
<td>0.02</td>
<td>0.81</td>
</tr>
<tr>
<td>Value</td>
<td>209</td>
<td>5.86</td>
<td>1.06</td>
<td>1.5</td>
<td>7</td>
<td>-0.86</td>
<td>0.63</td>
<td>0.77</td>
</tr>
<tr>
<td>Knowledge</td>
<td>209</td>
<td>4.17</td>
<td>1.59</td>
<td>1</td>
<td>7</td>
<td>-0.06</td>
<td>-0.54</td>
<td>0.66</td>
</tr>
<tr>
<td>Catch</td>
<td>209</td>
<td>5.88</td>
<td>0.85</td>
<td>2.4</td>
<td>7</td>
<td>-0.97</td>
<td>1.40</td>
<td>0.78</td>
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<tr>
<td>Hold</td>
<td>209</td>
<td>5.93</td>
<td>0.89</td>
<td>1.33</td>
<td>7</td>
<td>-1.49</td>
<td>4.13</td>
<td>0.88</td>
</tr>
<tr>
<td>Perceived Enthusiasm (Deep-feature)</td>
<td>209</td>
<td>6.44</td>
<td>0.64</td>
<td>4.25</td>
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<td>-1.44</td>
<td>1.72</td>
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<tr>
<td>Engagement Quality</td>
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<td>6.33</td>
<td>0.64</td>
<td>3.75</td>
<td>7</td>
<td>-1.10</td>
<td>1.08</td>
<td>0.69</td>
</tr>
<tr>
<td>Attractiveness of Displays</td>
<td>209</td>
<td>5.91</td>
<td>0.86</td>
<td>3</td>
<td>7</td>
<td>-0.75</td>
<td>0.20</td>
<td>0.73</td>
</tr>
<tr>
<td>Facilitation of Interest Development</td>
<td>209</td>
<td>6.07</td>
<td>0.78</td>
<td>2.67</td>
<td>7</td>
<td>-1.16</td>
<td>1.94</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Note. All measure used a 7-point Likert scale.

Table 3. Pearson correlations among outcome variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tbody>
<tr>
<td>1. Prior Individual Interest</td>
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<td>Catch</td>
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<td>3. Hold</td>
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<td>.674**</td>
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<td>6. Attractiveness of Displays</td>
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<td>.595**</td>
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<td>7. Facilitation of Interest Development</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>.544**</td>
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</table>

** Correlation is significant at the 0.01 level (2-tailed).
correlated with situational interest ($r = .37$ and $.58$ for catch and hold, respectively), and is relatively weakly related to perceived enthusiasm in museum educator and quality of engagement ($r = .21$ and $.23$, respectively, $p < .01$; Cohen, 1992). Situational interest, both catch and hold, displayed moderate to strong relationships with perceived enthusiasm, engagement quality, attractiveness of displays, and facilitation of interest development, especially between hold and facilitation of interest development ($r = .91$). The strong correlation suggested that the two constructs might not be conceptually separate from each other. Like perceived enthusiasm, engagement quality was weakly correlated with prior individual interest but strongly correlated with catch ($r = .69$) and hold ($r = .60$). Overall, the correlations among the variables indicated that the tour experience was generally cohesive and positive.

**MANOVA**

Multivariate analysis of variance was used to determine if participants’ outcomes were different based on their characteristics or contextual factors (see Table 4). The results showed that participants’ ethnicity ($F(45, 866) = 2.107, \ p < .01$, Wilk’s $\Lambda = 0.63$, partial $\eta^2 = .09$), language ability ($F(9, 192) = 5.344, \ p < .01$, Wilk’s $\Lambda = 0.80$, partial $\eta^2 = .20$) and personal connections with immigrant culture ($F(9, 196) = 6.063, \ p < .01$, Wilk’s $\Lambda = 0.78$, partial $\eta^2 = .22$) were related to participants’ individual interest in immigration history. For ethnicity, Bonferroni post hoc comparisons showed that African-American participants had lower affect toward the subject than Asian, Caucasian, and Hispanic participants ($p < .01$) and perceived less value in the subject than Asian participants ($p < .05$). Also, Caucasian participants had less knowledge of the subject than Asian participants ($p < .01$). However, the effect size for ethnicity is small, so these results may not be practically significant. For language ability, the post hoc test results indicated that participants who were bilingual had significantly more knowledge of the subject than participants who only spoke English ($F(1, 200) = 33.086, \ p < .01$, partial $\eta^2 = .14$).
For personal connections with the immigrants’ culture, the post hoc test indicated that participants who had personal connections had more positive affect about, saw more value in, and had more knowledge of immigration history than those who did not have personal connections (all \( p < .01 \)). There was also a statistically significant difference in participants’ affect based on their occupation (\( F(9, 183) = 2.281, p < .05 \), Wilk’s \( \Lambda = 0.90 \), partial \( \eta^2 = .10 \)). Participants who were not students had higher scores on affect than participants who were students.

For the outcome variables, one-way MANOVA indicated that participants’ gender, age, ethnicity, language ability, occupation (student), or personal connection with the museum or immigration culture were not significantly related to the measured outcomes. However, there was a difference in measured outcomes based on participants’ education level (\( F(36, 721) = 1.631, p < .05 \), Wilk’s \( \Lambda = 0.75 \), partial \( \eta^2 = .07 \)). Specifically, the test of between-subject effects further showed that education level had a significant effect on perceived-enthusiasm (\( F(4, 200) = 2.883, p < .05 \), partial \( \eta^2 = .06 \)), engagement quality (\( F(4, 200) = 3.708, p < .01 \), partial \( \eta^2 = .07 \)), and attractiveness of displays (\( F(4, 200) = 4.111, p < .01 \), partial \( \eta^2 = .08 \)). The Bonferroni post hoc test further revealed that participants who had a graduate degree had lower scores on the three outcomes compared to participants who had some college degree (\( p < .05 \) for perceived enthusiasm; \( p < .01 \) for engagement quality and attractiveness of displays).

The contextual factor that showed a statistically significant difference in outcomes was whether the participants paid for museum admission (\( F(9, 193) = 1.93, p < .05 \), Wilk’s \( \Lambda = 0.917 \), partial \( \eta^2 = .08 \)). Although the effects were small, the further post hoc analysis indicated that visitors who paid the admission fee perceived less enthusiasm in museum educators and rated the tour as less engaging comparing to participants who did not pay for admission (\( F(1,
201) = 5.782 and 6.431, \( p < .05 \), partial \( \eta^2 = .028 \) and .031, respectively). In addition, it is important to note that museums of different museum educators did not affect participant outcomes.

A two-way MANOVA was conducted to assess the impact of participants’ education level, and whether they paid for admission, on measured outcomes. The main effects of both factors remained the same as described above and no interaction was found.

### Table 4. Demographic information of participants and the context of their visits.

<table>
<thead>
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<th></th>
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<th>Mean</th>
<th>SD</th>
<th>Mode</th>
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</table>

*Note.* Categories for ethnicity include African American, Asian, Caucasian, Hispanic, Native American, and other. Categories for education include some high school, high school, some college, bachelor/associate, and graduate. Categories for museum goer include once per month, once couple months, once per year, and less than once per year.

**SEM**

The SEM was used to test the hypothesized model structure presented in Figure 1. The goal was to answer the research question: whether visitors’ individual and situational interest (catch and hold), and perceived enthusiasm in museum educators are related. The first estimation of the hypothesized model did not yield a good model fit. Specifically, the Wald test indicated
that the coefficient of one knowledge item was simultaneously equal to zero and should be removed from the model, $\chi^2(1) = 1.02, p = .31$. After removing the item, the model was re-estimated, and the results showed an adequate model fit, $\chi^2(141) = 377.74, p < .001$, RMSEA = .09, CFI = .92, TLI = .90, SRMR = .15), with a non-significant coefficient between perceived enthusiasm and hold ($p = .51$). The model was re-modified by removing the path between perceived enthusiasm and hold. The revised model is presented in Figure 2. The fit statistics suggested that the revised model adequately fit the observed data, $\chi^2(141) = 302.82, p < .001$, RMSEA = .08, 90% CI [.064, .087], CFI = .94, TLI = .93, SRMR = .13).

The findings suggested that both prior individual interest and perceived enthusiasm in museum educator had a moderate positive relationship with visitors’ situational interest. Specifically, prior individual interest was significantly and directly related to catch ($\beta = .28, z = 4.49, p < .001$), hold ($\beta = .37, z = 10.04, p < .001$), and perceived enthusiasm ($\beta = .42, z = 7.38, p < .001$). These results support hypotheses H2a, H2b, and H4. The hypothesis H1 was also supported as catch was directly related to hold ($\beta = .62, z = 12.28, p < .001$). For hypothesis H3a and H3b, a direct effect was only identified between perceived enthusiasm and catch ($\beta = .74, z = 10.01, p < .001$), but not between perceived enthusiasm and hold, which did not support the hypothesis H3b.

For indirect effects, there was a path from individual interest to catch interest mediated by perceived enthusiasm ($\beta = .30, z = 5.09, p < .001$), and two paths to hold interest from perceived enthusiasm via catch interest ($\beta = .46, z = 8.14, p < .001$) and from individual interest via perceived enthusiasm and catch interest ($\beta = .36, z = 10.62, p < .001$). These results suggest a complex relationship between individual interest and situational interest that can be explained by their connections with perceived enthusiasm (see Table 6 for direct and indirect effects).
Figure 2. The results of the revised research model of visitors’ interest and perceived-enthusiasm in museum educators.

![Diagram showing relationships between Individual Interest, Catch, Perceived Enthusiasm, and Hold with corresponding correlation coefficients.]

**List of indicators:**
- **Individual Interest:** PIQ questionnaire
  - Affect items (parceled) 1 & 2
  - Value items 1 & 3
  - Knowledge item 3
- **Catch:** SI questionnaire
  - Catch items 1 ~ 6
- **Hold:** SI questionnaire
  - Hold items 1 ~ 6
- **Perceived Enthusiasm:** VPE questionnaire
  - Deep feature item 1 ~ 4

**Table 5. Summary of hypothesis tests.**

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<th>Hypothesis</th>
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</tr>
<tr>
<td>H2a: Individual Interest --&gt; Catch</td>
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</tr>
<tr>
<td>H2b: Individual Interest --&gt; Hold</td>
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</tr>
<tr>
<td>H3a: Perceived-Enthusiasm --&gt; Catch</td>
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</tr>
<tr>
<td>H3b: Perceived-Enthusiasm --&gt; Hold</td>
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</tr>
<tr>
<td>H4: Individual Interest --&gt; Perceived-Enthusiasm</td>
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Table 6. Results of direct and indirect effects.

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<th>B</th>
<th>β</th>
<th>SE</th>
<th>p</th>
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CHAPTER 4. DISCUSSION

The purpose of this study was to investigate how museum educators’ enthusiasm for teaching—as perceived by museum visitors—relates to visitors’ individual and situational interest in the context of a museum tour. Specifically, the attempt was made to examine whether perception of museum educators’ EFT was related to visitors’ situational interest, namely catch and hold interest, and whether the relationship was associated with visitors’ prior individual interest. The results indicated that visitor-perceived enthusiasm is directly related to catch interest and indirectly to hold interest. It also mediates the relationship between visitors’ prior individual interest and catch interest. The following paragraphs first review the limitations of the study and then discuss interpretations of the findings and directions for future research.

Limitations

Before the findings of this study are discussed, several limitations must be addressed. First, the construct of perceived surface feature enthusiasm was not well-measured in the post-tour survey. The data screening showed that the items were not reliable and the correlations among items were low, suggesting either that the selected behaviors were not adequate indicators of perceived surface feature enthusiasm or that the construct of surface feature enthusiasm was not applicable in the museum setting. As a result, the construct was excluded from the data analyses, limiting the opportunity to examine how visitors’ individual interest could be related to deep and surface features of perceived enthusiasm. This result also suggested the need to reconsider and update the construct of surface feature educator enthusiasm, given that studies using surface features to define educator enthusiasm were mostly conducted decades ago and may not be relevant to today’s teaching practices and environments. Redefining surface features of educator enthusiasm may further help shape the construct of educator enthusiasm.
The other measure excluded in the final analyses was facilitation of interest development (FID) due to its high correlation with hold interest. This result not only showed the ineffectiveness of the questionnaire in capturing the targeted construct, but also highlighted the challenge of measuring the continuing process of interest development. Researchers have used several strategies to address this issue, such as using multiple repeated measures of situational interest (Knogler et al., 2015). However, a well-accepted measurement for capturing the progress of interest development has not been developed (Renninger & Hidi, 2011 & 2016).

Second, due to the sample size, several outcome variables, including attractiveness of display (AOD) and engagement quality (EQ), were not integrated into the final model. Although it is unclear how the two may affect the relationships among the key variables (visitors’ perceived enthusiasm, individual interest, and situational interest) in the current model, subsets of variables were tested during data analysis, and the preliminary results of these tests may provide some insights for future research. For example, previous studies suggested that AOD is related to student situational interest and moderated by prior individual interest (e.g., Durik & Harackiewicz, 2007). The preliminary results of the model using AOD, prior individual interest, catch interest, and hold interest suggested that AOD was positively correlated with individual interest and both catch and hold interest. Visitors with high individual interest are likely to be attracted by the display and have high situational interest. When EQ was included in the model (along with individual interest, catch interest, and hold interest), the preliminary results suggested a positive relationship between EQ and catch interest, but not hold interest. These tests of subset variables indicated potential relationships among AOD, EQ and other variables. However, these findings need to be further examined with the full model, and examined with a much larger sample size, given the complexity of the models and the number of parameters.
With respect to generalizability, the study only included one museum with five museum educators, so the results may not be representative for the larger population. In addition, because the museum studied was specifically concerned with immigration history, it is important to conduct studies in museums dedicated to other subjects and disciplines, such as science and technology, to generalize the findings. Nevertheless, it is likely that the results of this study can be applied to other museums or other museum settings because it was based on the dialogic tour format, which is limited in ways that museum educators could interact with visitors. In other museum settings, museum educators may have different ways, such as hands-on activities or workshops, to express their enthusiasm to visitors to better support their situational interest. However, it is also possible that museum educators’ enthusiasm may be irrelevant; other factors may sometimes be more important than the interaction between museum educators and visitors. For example, live animals in zoos or aquariums may be stronger factors in triggering visitors’ situational interest (Dohn, 2011) regardless of how museum educators engage with the visitors. Future studies are needed to better understand the relationship between museum educators’ enthusiasm and factors that may also support visitors’ situational interest.

Findings and Implications

Overall, the results of this study parallel the findings of studies conducted in formal education contexts (e.g., Kim & Schallert, 2014; Patrick et al., 2000). The SEM result supports that participants’ perception of educator enthusiasm was positively connected with their situational interest during the tour. Moreover, the relationship with perceived enthusiasm was different on the two situational interest, catch and hold.

On catch interest, the model indicated two direct effects, one from prior individual interest and the other from perceived enthusiasm, in which the latter is a stronger predictor than the former. This finding is similar to those of Kim and Schallert’s (2014) study conducted in
college classrooms, where students’ situational interest was predicted by their initial interest, perceived enthusiasm in teachers and peers, and their relationships with teachers and peers. However, when indirect effects were considered, the evidence from the present investigation diverged from that of previous research. Specifically, in this study, the connection between participants’ prior individual interest and catch interest was partially mediated by perceived enthusiasm. However, in Kim and Schallert’s (2014) study, students’ initial interest was not related to their perception of teacher enthusiasm, and no mediation effect of perceived enthusiasm on the relationship between initial interest and catch interest was found. This difference may be due to the different research design, the different natures of formal and informal education environments, or the subject-matters of the two studies. For example, in the shared context of the classroom, peer enthusiasm may influence the relationship between individual interest and perceived teacher enthusiasm (Keller et al., 2016; Kim & Schallert, 2014). In the museum environment, however, peer enthusiasm may not be relevant, because some visitors do not have shared previous experiences or familiarity with one another.

For hold interest, the data indicated two direct effects—one from prior individual interest and the other from catch interest. There was no direct effect of perceived enthusiasm on hold interest. This result also differs from Kim and Schallert’s study (2014), in which a strong relationship was discovered between perceived enthusiasm and hold interest. This difference may be due to the underlying assumptions of the models adopted in the two studies. Kim and Schallert (2014) assumed the relationship between catch and hold interest to be correlated but not causal. Thus, there was no path between catch and hold interest, and no mediation by catch interest on the relationship between perceived enthusiasm and hold interest. However, in the current study, consistent with the four-phase model of interest development (Renninger & Hidi,
the connection between catch and hold interest was hypothesized as causal with catch interest preceding hold interest. Under this model, there was a direct path from catch interest to hold interest, and the result indicated that this path fully mediated the connection between perceived enthusiasm and hold interest. This result highlights the theoretical difference between catch interest and hold interest. Based on the interest development model, a shift from catch interest to hold interest requires an increase in an individual’s knowledge and value of the subject of the interest. The lack of a direct path from perceived enthusiasm to hold interest shows that museum educators’ enthusiasm is not directly related to visitors’ knowledge or value of the subject. Instead, the result indicated a positive direct relationship between participants’ prior individual interest and their hold interest, showing that visitors who had higher individual interest (implying some prior knowledge of the subject) were more likely to have high hold interest, in addition to whether or not they experienced the museum tour as fun or attractive. In other words, museum educators’ enthusiasm may capture visitors’ attention and creating a fun and enjoyable experience, thus triggering catch interest, but enjoyment itself may not be enough to hold visitors’ situational interest unless the visitors acquire certain knowledge about the subject and further understand the meaning and value of the subject. Moreover, the indirect effects show that perceived enthusiasm explains visitor hold interest through catch interest, suggesting that visitors’ enjoyment of the experience may be needed to hold their situational interest in addition to perceiving museum educators’ enthusiasm. Together, these results support the assertion that visitors with high prior individual interest are likely to have high hold interest, which can be explained partially by their perceived enthusiasm and catch interest.

The findings from the present study provide important information for future research on informal education contexts and individuals’ experiences in them. First, based on the results, it is
clear that studies of visitors’ or students’ interest in museum settings need to consider museum educators and their enthusiasm into consideration. Enthusiasm is an important variable that directly contributes to interest outcomes (e.g., situational interest) while also interacting with other contextual and individual variables. For example, several studies investigated how autonomy support enhances students’ intrinsic motivation during field trips to museums (Basten et al., 2014; Wilde & Urhahne, 2008). However, these studies focused only on the program or activity settings’ relationships with student autonomy (e.g., giving free time to explore or using open-ended worksheets); they did not examine how the program or activity was delivered by the museum educators. It is possible, for instance, that students may engage with exhibits differently during their free play depending on their perception of their museum educators’ enthusiasm. Previous studies conducted in classrooms have shown a positive connection between educator enthusiasm and students’ voluntary exploration (Wild et al., 1992).

Second, in terms of visitors’ and students’ learning outcomes, studies had explored the relationships among educator enthusiasm and students’ motivation constructs besides interest, such as goal orientation and self-efficacy (Zhang, 2014). The overall results showed positive connections between educator enthusiasm and these motivation outcomes. However, given that the current definition of educator enthusiasm remains under reconstruction (Keller et al., 2016; Kunter et al., 2008), more studies will be needed to unpack teachers’ and museum educators’ influence beyond interest in order to benefit students in both formal and informal learning environments.

Last but not least, the study highlighted the sociocultural aspects of informal learning. Learning in informal settings is often a social experience. Most people come to museums with their friends and families, and many join tours or programs led by museum educators (DeWitt &
Storksdieck, 2008; Falk & Dierking, 1992). As there is an increasing focus on sociocultural perspectives on motivation constructs (Kaplan & Patrick, 2016; McInerney, Walker, & Liem, 2011), it is important to better understand the social environments in museum settings in order to support visitors’ motivation and learning. Although a substantial body of research has focused on social interactions among family members and peers (e.g., Ash, 2003; Dohn, 2011; Palmquist & Crowley, 2007), little is known about how museum educators interact with visitors and contribute to their museum experiences. By looking specifically at museum educators’ enthusiasm, the study indicated how museum educators could create an engaging learning environment that may facilitate visitors’ interest development. Future studies using qualitative approaches will be helpful in examining the details of interactions between museum educators and visitors.
CHAPTER 5. CONCLUSION

Informal education environments such as museums are important educational resources. The current study investigated whether museum educators is related to visitors’ museum experience. The results indicate a positive relationship between visitors’ perceived enthusiasm in museum educators and their situational interest, and suggest that museum educators’ EFT could be an effective and practical way to support visitors’ interest development. These findings also provide important insights for researchers and professionals into the significant role played by museum educators in providing engaging learning experiences in informal learning environments.
REFERENCES


Little, T. D., Lindenberger, U., & Nesselroade, J. R. (1999). On selecting indicators for multivariate measurement and modeling with latent variables: When” good” indicators are bad and” bad” indicators are good. *Psychological Methods, 4*, 192-211.


# APPENDIX A. VISITOR INFORMATION

<table>
<thead>
<tr>
<th>Name</th>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity</th>
<th>Residence</th>
<th>Zip code or other country</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Language spoken</th>
<th>Education level</th>
<th>Do you come with others? Yes/No</th>
<th>If yes, with whom?</th>
<th>Did you pay for admission? Yes/No</th>
<th>Are you the museum member? Yes/No</th>
<th>What is the main reason for your visit today?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I came to learn about the museum and the history of [topic of museum/tours].</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>My friend/children/other family member wanted to come.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I am interested in [topic of museum/tours].</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I came to check out this museum.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I came to relax and have fun.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Have you visited this museum before? Yes/No</td>
</tr>
</tbody>
</table>


How often do you visit museums?

- At least once per month
- Once every couple months
- Once per year
- Less than once per year

Do you have a personal connection to Chinese American history or culture? Yes/No

- If yes, because ________________

Do you have family members who are Chinese American? Yes/No
APPENDIX B. MUSEUM EDUCATOR INFORMATION

Name

Gender

Age

Ethnicity

Language spoken

Employee or volunteer

Experience

  ____ years working as museum educator at this museum, including this year
  ____ years working as museum educator in total, including this year
  ____ years of working as educator (other than museum educator)
  ____ tours led per week

Educational background

  High school/some college/college graduate/graduate school
  Majored in _________ in school/college
  Professional training in ____________

  Do you have a personal connection to Jewish/Immigrant/Chinese American history or culture? Yes/No

  If yes, because __________________

Do you have family members who are Jewish/Immigrants/Chinese American?
## APPENDIX C. PRIOR INDIVIDUAL INTEREST (PII)

Table 7. *Comparison of modified and original items of PII.*

<table>
<thead>
<tr>
<th>Modified items</th>
<th>Original items (Harackiewicz et al., 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-items, ( \alpha = .76 )</td>
<td><em>Initial interest</em> (7-items, ( \alpha = .90 ))</td>
</tr>
<tr>
<td>I’ve been fascinated by the history of Chinese American. (A)</td>
<td>I’ve always been fascinated by psychology.</td>
</tr>
<tr>
<td>I decided to take this tour because I’m really interested in the history of Chinese American and immigration.</td>
<td>I chose to take Introductory Psychology because I’m really interested in the topic.</td>
</tr>
<tr>
<td>I’m excited about the tour. (A)</td>
<td>I’m really excited about taking this class.</td>
</tr>
<tr>
<td>I’m looking forward to learning more about Chinese American and immigration. (A)</td>
<td>I’m really looking forward to learning more about psychology.</td>
</tr>
<tr>
<td>I think the history of Chinese immigration is an important topic. (V)</td>
<td>I think the field of psychology is an important discipline.</td>
</tr>
<tr>
<td>I think the history of Chinese American is important for me to know. (V)</td>
<td>I think what we will study in Introductory Psychology will be important for me to know.</td>
</tr>
<tr>
<td>I don’t think the history of Chinese immigration is worthwhile to know. (reversed) (V)</td>
<td>I think what we will study in Introductory Psychology will be worthwhile to know.</td>
</tr>
</tbody>
</table>

**Background knowledge** (3-items, \( \alpha = .90 \))

| I often come across things/stories related to Chinese immigration history. (K) | This class is my first exposure to the field of psychology. (reversed) |
| I have some background in the history of Chinese American and immigration. (K) | I already have some background in psychology (e.g., I studied psychology in another class or did reading on my own). |
| I have little knowledge of the history of Chinese American and immigration. (reversed) (K) | I have very little experience with psychology. (reversed) |

*Note.* A=affect, V=value, K=knowledge. Items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree).
## APPENDIX D. SITUATIONAL INTEREST (SI)

Table 8. *Comparison of modified and original items of SI.*

<table>
<thead>
<tr>
<th>Modified items</th>
<th>Original items (Knogler et al., 2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>When you think of the previous tour, to what extent…</td>
<td>When you think of the previous (module’s) sessions, to what extent…</td>
</tr>
<tr>
<td>Catch (6-items, $\alpha = .78$)</td>
<td>Catch (6-items, $\alpha = .90$)</td>
</tr>
<tr>
<td>The tour sparked my curiosity.</td>
<td>Did the session spark your curiosity?</td>
</tr>
<tr>
<td>The tour captured my attention.</td>
<td>Did the session capture your attention?</td>
</tr>
<tr>
<td>It was hard to stay focused during the tour.</td>
<td>Were you concentrated on the session?</td>
</tr>
<tr>
<td>I enjoyed the tour.</td>
<td>Was the session entertaining for you?</td>
</tr>
<tr>
<td>I am pleased that I took the tour.</td>
<td>Did you have fun during the session?</td>
</tr>
<tr>
<td>The tour was exciting for me.</td>
<td>Was the session exciting for you?</td>
</tr>
<tr>
<td>Hold (6-items, $\alpha = .88$)</td>
<td>Hold (6-items, $\alpha = .88$)</td>
</tr>
<tr>
<td>I would like to talk about the topics of the tour with my friends or family.</td>
<td>Would you like to discuss the topics of the session with others?</td>
</tr>
<tr>
<td>I would like to have more information on Chinese immigration.</td>
<td>Would you like to have more information on the session’s topics?</td>
</tr>
<tr>
<td>I would to learn more about certain topics from the tour.</td>
<td>Would you like to learn more about certain topics from the session?</td>
</tr>
<tr>
<td>I found the topics of the tour useful.</td>
<td>Did you find it useful for you to engage with the topics of the session?</td>
</tr>
<tr>
<td>The topics covered in the tour matter to me.</td>
<td>Did you find that the topics of the session matter to you?</td>
</tr>
<tr>
<td>It was important for me to learn about the history of Chinese American.</td>
<td>Was it important for you to learn about the session’s topics?</td>
</tr>
</tbody>
</table>

*Note.* Items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree).
### APPENDIX E. VISITOR-PERCEIVED ENTHUSIASM (VPE)

Table 9. *Comparison of modified and original items of VPE.*

<table>
<thead>
<tr>
<th>Modified items</th>
<th>Original items (Frenzel et al., 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Deep-feature</em>, 4-items, $\alpha = .84$</td>
<td>4-items, $\alpha = .85$</td>
</tr>
<tr>
<td>Our tour guide taught with enthusiasm.</td>
<td>Our mathematics teacher teaches with enthusiasm.</td>
</tr>
<tr>
<td>Our tour guide was passionate about the history of Chinese immigration</td>
<td>Our mathematics teacher is humorous during teaching.</td>
</tr>
<tr>
<td>Our tour guide tried to get us excited about the history of Chinese immigration</td>
<td>Our mathematics teacher tries to get students excited about the subject of mathematics.</td>
</tr>
<tr>
<td>Our tour guide seemed to take pleasure in talking about the history of Chinese American and immigration</td>
<td>Our mathematics teacher really seems to take pleasure in teaching.</td>
</tr>
</tbody>
</table>

| *Surface-feature*, 4-items, $\alpha = .51$                                         |                                                             |
| Our tour guide made a lot of eye contact.                                          |                                                             |
| Our tour guide often moved around when talking.                                    |                                                             |
| Our tour guide talked quickly.                                                     |                                                             |
| Our tour guide often used hand gestures or body language.                          |                                                             |

*Note.* Items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree).
## APPENDIX F. MUSEUM EDUCATOR SELF-REPORTED ENTHUSIASM (MESRE)

Table 10. *Comparison of modified and original items of MESRE.*

<table>
<thead>
<tr>
<th>Modified items</th>
<th>Original items (Kunter et al., 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-items</td>
<td>Teaching Enthusiasm (5 items, $\alpha = .85$)</td>
</tr>
<tr>
<td>I lead the tour with great enthusiasm.</td>
<td>I teach [mathematics in this class] with great enthusiasm.</td>
</tr>
<tr>
<td>I enjoy teaching the history of Chinese American and immigration in the tour.</td>
<td>I really enjoy teaching [mathematics in this class].</td>
</tr>
<tr>
<td>I enjoy teaching visitors new things.</td>
<td>I always enjoy teaching students new things.</td>
</tr>
<tr>
<td>Sometimes I do not enjoy interacting with visitors. (reversed)</td>
<td>I enjoy interacting with students.</td>
</tr>
<tr>
<td>Sometimes I am tired of teaching. (reversed)</td>
<td>It's a pleasure to teach.</td>
</tr>
<tr>
<td>I love to help visitors learn.</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree).
## APPENDIX G. ATTRACTIVENESS OF DISPLAYS (AOD)

Table 11. *Comparison of modified and original items of AOD.*

<table>
<thead>
<tr>
<th>Modified items</th>
<th>Original items (Durik &amp; Harackiewicz, 2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-items, $\alpha = .73 ^*$</td>
<td>3-items</td>
</tr>
<tr>
<td>The exhibition displays caught my attention.</td>
<td>The instructional notebook really caught my attention.</td>
</tr>
<tr>
<td>The exhibition displays were dull. (reversed)</td>
<td>The Multiplication Technique Notebook was dull.</td>
</tr>
<tr>
<td>I like the way the displays were laid out.</td>
<td>I like the way the notebook was laid out.</td>
</tr>
<tr>
<td>The displays surprised me in a positive way.</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree).
*The alpha level is based on three items, excluding item #2.*
APPENDIX H. ENGAGEMENT QUALITY (EQ)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our tour guide provided a lot of knowledge about the history of Chinese immigration.</td>
<td></td>
</tr>
<tr>
<td>Our tour guide helped us understand the history of Chinese immigration.</td>
<td></td>
</tr>
<tr>
<td>I think the tour was very engaging.</td>
<td></td>
</tr>
<tr>
<td>Our tour guide encouraged people to talk or ask questions during the tour.</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree).
# APPENDIX I. FACILITATION OF INTEREST DEVELOPMENT (FID)

Table 13. *Items of FID.*

<table>
<thead>
<tr>
<th>Items (6-items, α = .85)</th>
<th>Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think there are many interesting questions about the history of Chinese American and immigration.</td>
<td>Gaining knowledge and idea</td>
</tr>
<tr>
<td>I want to know more about the history of Chinese immigration in the future.</td>
<td>Gaining knowledge and ideas</td>
</tr>
<tr>
<td>I want to find out where to get more information about Chinese immigration history.</td>
<td>Gaining knowledge and ideas</td>
</tr>
<tr>
<td>I think it is important for me to join more tours like this in the future.</td>
<td>Valuing future engagement</td>
</tr>
<tr>
<td>I think knowing more about the history of Chinese immigration is meaningful.</td>
<td>Valuing future engagement</td>
</tr>
<tr>
<td>Learning more about the history of Chinese immigration is important.</td>
<td>Valuing future engagement</td>
</tr>
</tbody>
</table>

*Note.* Items were rated on a seven-point scale from 1 (strongly disagree) to 7 (strongly agree).
APPENDIX J. CONSENT FORM: MUSEUM EDUCATOR

RESEARCH PARTICIPANT CONSENT FORM: MUSEUM EDUCATOR
Investigating Museum Educators' Enthusiasm and Visitors' Interest
Youli Mantzicopoulos, Ph.D. & C. James Liu
Department of Educational Studies
Purdue University

What is the purpose of this study?
In this study we will document museum visitors' experiences in tours led by a museum educator. We are planning to work with twenty museum educators, and are asking you to participate in this study because you are a museum educator.

What will I do if I choose to be in this study?
We would like to have your permission to collect information about you and from tours that you lead in the museum. The data will include: (a) demographic information (e.g., age & teaching experience), (b) observations during the tours in which we will take notes about what happens in the tour, and (c) 5 to 10 minutes interviews with you at the end of your tours. During the interviews, we will ask you about your thoughts and feedback about the tours you lead. The interviews will be audio recorded.

How long will I be in the study?
The project will run from summer 2016 to fall 2016. We plan to recruit 30 visitors from each museum educator. Because it may be difficult to predict the number of visitors who will be participating in the study in each tour, we may need to collect data more the once from your tour. Therefore, it may take several days or weeks to collect data. On the tour day, in addition to the length of the tour, it will take approximately 20-30 minutes for preparation before the tour and about 10 minutes after the tour for the brief interview with you.

What are the possible risks or discomforts?
The risk to you is no more than your ordinary experience in leading a museum tour.

Are there any potential benefits?
There will be no direct benefits for you to participating in this study. We do hope our study will help museums in the future to create better tours and learning environments for visitors and to provide professional development for museum educators.

Will information about me and my participation be kept confidential?
Yes. All information collected in the study (e.g., survey and interview) will be protected and kept confidential entirely. The museum or visitors will never receive any identifiable information about you and your tour experiences from the study. Only members of our research team will have the access to your information.
The interviews will be transcribed. We will use pseudonyms in presenting and communicating the data and findings. Aggregated information may be shared with museums as reports, but no information will identify individual participants. Your information will be securely stored in locked cabinets or password-protected computers and server in the project office on Purdue
campus. All data will be disposed 15 years after the end of the study. The data may be used in other studies in the future.
The project’s research records may be reviewed by the Institute of Education Sciences, Office for Human Research Protection, and by departments at Purdue University responsible for regulatory and research oversight.
As for all research, there is a risk of a breach of confidentiality in this study. However, we have protocol in place described earlier to protect your information.

What are my rights if I take part in this study?

Your participation in this study is entirely voluntary. You may choose not to participate or, if you agree to participate, you can withdraw your participation at any time without any penalty. Your job as a museum educator will not be affected by your decision of whether or not to participate in the study.

Who can I contact if I have questions about the study?

If you have questions, comments or concerns about this research project, you can talk to one of the researchers. Please contact Youli Mantzicopoulos (mantzi@purdue.edu or 765-494-7247) or James Liu (liu1134@purdue.edu or 315-420-0925)

If you have questions about your rights while taking part in the study or have concerns about the treatment of research participants, please call the Human Research Protection Program at (765) 494-5942, email (irb@purdue.edu) or write to:

Human Research Protection Program - Purdue University
Ernest C. Young Hall, Room 1032
155 S. Grant St.,
West Lafayette, IN 47907-2114

Documentation of Informed Consent

I have had the opportunity to read this consent form and have the research study explained. I have had the opportunity to ask questions about the research study, and my questions have been answered. I am prepared to participate in the research study described above. I will be offered a copy of this consent form after I sign it.

___________________________________                           _________________________
Participant’s Signature                                     Date

___________________________________
Participant’s Name

___________________________________                           ___________________________
Researcher’s Signature                                     Date
APPENDIX K. CONSENT FORM: VISITOR

RESEARCH PARTICIPANT CONSENT FORM: VISITOR
Investigating Museum Educators' Enthusiasm and Visitors' Interest
Youli Mantzicopoulos, Ph.D. & C. James Liu
Department of Educational Studies
Purdue University

What is the purpose of this study?
In this study we will document museum visitors' experiences in tours led by a museum educator. We are planning to work with twenty museum educators and are asking your participation because your tour guide is participating in this study.

What will I do if I choose to be in this study?
We would like to have your permission to collect information about you and your museum experiences. The tasks you will be doing include: (a) filling out a survey about your demographic information (e.g., age and occupation) and prior museum experiences, (b) being observed during the tour in which we will take notes about what happens in the tour, (c) filling out a survey after the tour to share your thoughts and feedback, and (d) joining a 5 to 10 minutes interview after the tour. During the interview, we will ask you about your tour experience. The interview will be audio recorded.

How long will I be in the study?
You will participate in the study while joining the tour at the museum and right after the tour for answering a survey and joining a short interview.

What are the possible risks or discomforts?
The risk to you is no more than your ordinary experience in a museum tour.

Are there any potential benefits?
There will be no direct benefits for you as a result of your participation in this study. We do hope our study will help museums in the future to provide better tours and learning environments for visitors.

Will information about me and my participation be kept confidential?
Yes. All information collected in the study (e.g., survey and interview) will be protected and kept confidential entirely. The museum will never receive any identifiable information about you and your museum experiences from the study. Only members of our research team will have the access to your information.

The interview will be transcribed. We will use pseudonyms in presenting and communicating the data and findings. Aggregated information may be shared with museums as reports, but no information will identify individual participants. Your information will be securely stored in locked cabinets or password-protected computers and server in the project office on Purdue campus. All data will be disposed 15 years after the end of the study. The data may be used in other studies in the future.
The project’s research records may be reviewed by the Institute of Education Sciences, Office for Human Research Protections, and by departments at Purdue University responsible for regulatory and research oversight. As for all research, there is a risk of a breach of confidentiality in this study. However, we have protocol in place described earlier to protect your information.

**What are my rights if I take part in this study?**

Your participation in this study is entirely voluntary. You may choose not to participate or, if you agree to participate, you can withdraw your participation at any time without any penalty. You can join the tour whether or not you decide to participate in the study.

**Who can I contact if I have questions about the study?**

If you have questions, comments or concerns about this research project, you can talk to one of the researchers. Please contact Youli Mantzicopoulos (mantzi@purdue.edu or 765-494-7247) or James Liu (liu1134@purdue.edu or 315-420-0925)

If you have questions about your rights while taking part in the study or have concerns about the treatment of research participants, please call the Human Research Protection Program at (765) 494-5942, email (irb@purdue.edu) or write to:

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**Documentation of Informed Consent**

I have had the opportunity to read this consent form and have the research study explained. I have had the opportunity to ask questions about the research study, and my questions have been answered. I am prepared to participate in the research study described above. I will be offered a copy of this consent form after I sign it.

_______________________________________                           _________________________  
Participant’s Signature                                                Date

_______________________________________                          ___________________________________  
Participant’s Name                                                   Researcher’s Signature

_______________________________________                          _________________________  
Date
VITA

EDUCATION

National Taiwan University  Psychology  B.S.  2005
City College of New York  Cognitive Psychology  M.A. 2009
City College of New York  Museum Studies  M.A. 2011
Purdue University  Educational Psychology  Ph.D. 2018

ACADEMIC/PROFESSIONAL APPOINTMENTS

2016 – Present  Research Associate, New York Hall of Science
2013 – 2018  Research Assistant, Department of Educational Studies, Purdue University
2011 – 2016  Education Coordinator & Evaluation Consultant, Cool Culture
2010 – 2012  Curatorial Intern and Visitor Experience Associate, Rubin Museum of Art
2008 – 2010  Research Assistant and Adjunct Instructor, Department of Psychology, City College of New York
2008 – 2008  Research Assistant, Statistic Laboratory, Queens College

PUBLICATIONS


PRESENTATIONS


Liu, C. J. (2014, March). The museum experience through the visitors’ eyes: The interplay of the museum with visitors’ cultural, political, and religious beliefs. Poster session presented at the Annual Graduate Student Educational Research Symposium, Purdue University, West Lafayette, IN.
Liu, C. J. (2016, March). *Enthusiastic educators and interested visitors: Investigating museum educators' enthusiasm and visitors' interest.* Poster session presented at the Annual Graduate Student Educational Research Symposium, Purdue University, West Lafayette, IN.


MANUSCRIPT, DISSERTATION & THESIS


Liu, C. J. Enthusiastic educators and interested visitors: Investigating museum educators' enthusiasm and visitors' interest. (Dissertation). Chair: Dr. P. Youli Mantzicopoulos


AWARD

2009  Joseph E. Barmack Awards, City College of New York

2016   Linden Graduate Scholarship, Purdue University

SUPPORTING FOUNDING & GRANTS


**EXPERIENCES, SKILLS, & CERTIFICATIONS**

Certificate for teacher assessments

- Classroom Assessment Scoring System (CLASS), K-3 (2014 - present)
- Mathematical Quality of Instruction (MQI) (2014 - present)

Teaching experiences:

- Social Psychology (undergraduate), City College of New York, 2009 – 2010

Professional skills:

- Program design and evaluation in informal education settings
- Professional translation for writing and oral translation (Chinese)
- Proficient in statistic software, including SPSS, Stata, and HLM

**SERVICE**

Service to the College and Department

- Material Manager, Graduate Organization in Educational Studies, 2015
- Faculty Search Committee, Department of Educational Studies, 2014
Service to Academic Communities

Peer group coordinator, NYC Museum Educators Roundtable (2017-2018)

Conference Submission Reviewer,

Annual Convention of the American Educational Research Association

Annual International Conference of National Association for Research in Science Teaching

AFFILIATIONS

American Educational Research Association

American Psychology Association

National Association for Research in Science Teaching

National Science Teachers Association

NYC Museum Educators Roundtable

Visitor Studies Association