Evaluating the Effectiveness of Supplemental Labels in Museum Exhibits

Clint B. Eliason

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EVALUATING THE EFFECTIVENESS OF SUPPLEMENTAL LABELS IN MUSEUM EXHIBITS

by

Clint B. Eliason

A dissertation submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Psychology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

2007
ABSTRACT

Evaluating the Effectiveness of Supplemental Labels in Museum Exhibits

by

Clint B. Eliason, Doctor of Philosophy
Utah State University, 2007

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Department: Psychology

The present study used an experimental design to investigate the efficacy of using short (12 words or less), prominently placed supplemental labels to increase the effectiveness of select extant labels in museum exhibits. The experimenter-developed supplemental labels were designed to leverage exogenous/bottom-up and endogenous/top-down sources of influence on selective attention. Measures of patron behavior, knowledge retention, and attitude found no significant differences between group means under control and treatment conditions. These outcomes were surprising and inconsistent with findings from similar research conducted by Hirschi and Screven. The supplemental labels in the present study might have failed to capture attention because they were not sufficiently visually stimulating, they did not sufficiently tap internal motivations, or perhaps patrons experienced innattentional blindness in regards to them.
ACKNOWLEDGMENTS

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Clint B. Eliason
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CHAPTER I
INTRODUCTION

Museums have been a part of the American cultural fabric since the late 1700s (Mayer, 2003). Today, there are over 15,000 museums, zoos, aquariums, historical sites, and other informal learning centers in the United States (Museums USA, n.d.). Each year, over half a billion visits are made to these institutions (American Association of Museums, 1994). Regardless of content or physical setting, a principal goal of all museums is to convey information. The primary method museums use to communicate with their audiences is through exhibit displays. A typical museum exhibit is comprised of objects, artifacts, or specimens and accompanying text labels.

Almost all of what people learn from informal education settings stems from the exhibits themselves or labels about the exhibits (Schnackenberg, Savenye, & Jones, 1997). Unfortunately, most patrons choose to read few or none of the labels. On average, only about 10-20% of adult visitors stop to read exhibit labels in typical museum exhibitions (Bitgood, Nichols, Pierce, Conroy, & Patterson, 1986; Borun & Miller, 1980; Falk & Dierking, 1992; Porter, 1938). One possible explanation for this phenomenon is that the labels fail to capture or hold patrons’ attention.

It has been well documented in cognitive research that individuals have a limited attentional capacity, and objects that fail to achieve a threshold of visual salience are typically overlooked (Simons, 2000; Treisman & Gelade 1980). Both exogenous (bottom-up) and endogenous (top-down) factors have been shown to influence attentional focus (Braun, 1998; Itti, 2004; Rock & Gutman, 1981). Objects that successfully capture
attention receive almost exclusive use of available cognitive resources (Itti & Koch, 2001; Koch & Ullman, 1985). Through applied use of relevant attention-related theories, museums might be able to improve the effectiveness of their educational efforts. Much of the responsibility in this initiative falls to the exhibit labels.

One means of increasing the readership of exhibit labels might be to add small, highly salient supplemental labels designed to redirect attention to extant exhibit labels. To date, only one published study has directly investigated the use of supplemental labels in museum exhibits (Hirschi & Screven, 1988). Although the reported treatment effects from this study are impressive, the research methods employed are questionable. Despite potentially serious threats to internal validity, the Hirschi and Screven study does at least hint at the possibility of using supplemental labels.

The present study investigated the efficacy of using short (12 words or less), prominently placed supplemental labels to increase the effectiveness of selected extant exhibit labels. It was theorized that supplemental labels could be a low-cost, high-impact means of increasing the educational effectiveness of targeted museum exhibits. The intended purpose of supplemental labels was to highlight select exhibit labels, rather than be applied to every exhibit museum-wide.

This dissertation includes a review of relevant literature from museum studies and cognitive psychology: description of research methods, analysis of results, and discussion of findings for the present study; list of literature references; and appendices of supplemental materials.
CHAPTER II
REVIEW OF THE LITERATURE

This literature review presents the theoretical framework from which the intended purpose and methods of the present research were derived. The search process for this literature review was delimited only minimally so as to identify a broad spectrum of relevant research. This process involved a systematic search of electronic databases and indexes (e.g., ERIC, PsychInfo, Digital Dissertations, Art Full Text, Education Full Text, and Google Scholar), reference lists, primary studies, and book chapters. The literature search was conducted in two phases. Phase one of the literature review focused on learning in the museum environment, especially studies involving exhibit labels. Phase two of the literature review focused on studies and theories relating to attention, saliency, and similar cognitive psychology topics.

Phase One—Learning in Museums

Traditional definitions of key museum-related terms were used during the literature search process and throughout this review. The term museum refers to a not-for-profit, permanent institution that is open to the public and which acquires, conserves, and displays objects for purposes of study, education, and enjoyment (ICOM, 2004). A museum exhibit is a tangible display designed for public exhibition, such as a panel, a case, a diorama, a set of artifacts, a computer, or an interactive device (Serrell, 1996). An exhibit label denotes any signage containing textual information about an object or item of inquiry in a museum exhibit, often taking the form of titles, blurbs, explanations,
captions, placards, and “those little words on the wall” (Serrell, p. 239). For the purpose of the present study, the term *extant labels* refers to labels currently used in museum exhibits, and the term *supplemental labels* refers to new labels created for the present study.

Several aspects of learning in the museum environment were noted in the literature. The following sections introduce and summarize these issues and their significance to supplemental label design. Applicable topics included the evolution of public education in museums, effectiveness of extant exhibit labels, and improving the effectiveness of extant exhibit labels by adding supplemental labels.

*History and Current Practice*

Although museums have always had some interest in reaching out to the general public, doing so has not been viewed as critical to their success until relatively recently. Up until the late 20th century, museums tended to be primarily concerned with collections and research, rather than with visitors and their education (Chang, 2006). Over the past couple decades museums have begun changing from static storehouses of artifacts to active visitor-centered learning environments (Hooper-Greenhill, 1994, 1999). The American Association of Museums (1994, p. 8) acknowledges that “museums can no longer confine themselves simply to preservation, scholarship, and exhibition independent of the social context in which they exist.”

Museums are now viewed as an important component of the overall educational mix in this country. There is immense potential for informal educational settings to serve as learning resources (Falk, 1984). The average American will have far more exposure to
science ideas over their lifetimes through informal science experiences such as visits to museums and through diverse media sources than through traditional classroom experiences (Hill, 2002). Regardless of thematic focus, the mission statements of virtually all museums now include an educational component.

The shift in focus from artifact preservation to public education has introduced a host of challenges for today’s museums. Introducing new science concepts to museum visitors can be problematic (Henriksen & Doris, 2001). Without prior knowledge on which to build, patrons lack direction in their attempts to make sense of their museum experience and often fail to interpret museum exhibits correctly (Borun & Adams, 1992). Museums need to become more creative in helping visitors make choices that will shape their visit and lead to correct interpretations of exhibits (Pekarik, 2004). Some of the most opportune points of contact for museums to inform and guide their patrons are the exhibit labels. As museums continue to become more educationally focused, exhibit labels are likely to play an increasingly crucial role.

*Exhibit Labels*

It is widely acknowledged that most museum patrons would prefer not to read exhibit labels (Gammon, 1999). Gammon also suggested that label text should be clear and concise and there must be a strong incentive to read exhibit labels. Gammon drew his conclusions about labeling best practices from testing almost 100 interactive exhibits at the Science Museum, London, and findings from a formative evaluation conducted for the Science Museum’s Welcome Wing during the 1990s.
To help better achieve desired educational outcomes, museum researchers have suggested numerous methods for improving exhibit labels. Some of the proposed techniques include simpler messages (Schnackenberg et al., 1997), provocative statements (Cohen, 1993), isolating a museum object and accompanying label from other objects (Melton, 1935, 1972), and using a contrasting color for the label relative to its surroundings (Bitgood, 2000).

Another facet of label design that has generated a fair amount of interest is the use of prominently placed questions. While conducting a qualitative study of visitor experiences at the Birmingham Museum and Art Gallery in Birmingham, England, Jones (1995, p. 266) noted that "questions [in exhibit labels] serve to empower visitors and sensitize them to the relative 'authority' of the text. Questions also cue visitor behaviour. Visitors are expected to be active participants rather than passive receivers." Based on this and similar sentiments, several researchers have attempted to quantify the effects of questions in exhibit labels (e.g., Borun & Adams, 1992; Litwak, 1996; Screven, 1975; Serrell, 1979). For example, Screven investigated the interaction effects of various forms of guidance devices and the use of questions on typical visitors (N = 736) age 14 and older at the Renwick Gallery of the Smithsonian Institution, Washington, DC. Specifically, Screven compared portable punchboard and booklets with and without questions, audio tours with and without questions, and new exhibit labels with and without questions. All treatments increased learning. Audio tours with questions were the most effective and most liked. New labels with questions tested slightly better than new labels without questions and both tested better than the old labels. Instrumentation and
selection procedures were not completely clear, but, all in all, it appears to have been a well-designed study with only minor threats to validity.

More recently, Litwak (1996), as part of her dissertation research, investigated different types of questions in museum labels. The study involved manipulating label titles of eight large dioramas in the Bell Museum of Natural History at the University of Minnesota to create the experimental conditions. Four types of label titles were created: statement titles, explicit questions, implicit questions, and open-ended questions. A new round of experimental labels was installed each week for four weeks. Subjects across the three treatment conditions (questions as titles), on average, scored 9.3% higher on a postvisit knowledge test than did those in the control condition (statements as titles). There were no significant differences between the question types. Overall, reporting of research methods was adequate though could have been more complete. Standard deviations were not reported, and the participant selection process was not fully described. If the participants (157 college students) were all drawn from the same class, then after the first few participants filled out the post-visit quiz it is possible that they told their classmates what the study was about and what to expect. Left unchecked, participant assignment issues could have posed a serious threat to the validity of the conclusions.

Suggestions from museum studies researchers for improving exhibit label effectiveness typically involve creating new labels. However, creating new labels is often time consuming and expensive. Largely overlooked in the endeavor to increase label effectiveness has been investigating ways of maximizing existing labels. An ideal solution to the problem of low readership of exhibit labels would be a means of efficiently and inexpensively improving the effectiveness of extant exhibit labels.
A New Life for Extant Exhibit Labels

One possible means of improving the effectiveness of select extant labels is to add small, salient supplemental labels. The intended purpose of the supplemental labels would be two-fold: (a) capture visual attention, and (b) stimulate a desire to read target extant labels. Currently there is only one study in the literature that has investigated the application of supplemental labels in museum exhibits (Hirschi & Screven, 1988). However, even this study did not focus on the efficacy of supplemental labels per se.

The stated purpose of the study conducted by Hirschi and Screven (1988) was to measure the effectiveness of using questions in museum labels. The researchers attached small paper labels to the outside of five glass-case exhibits in the Milwaukee Public Museum. Each supplemental label contained a single short question. Answers to the questions could be found in the extant exhibit labels. Effectiveness of the supplemental labels was assessed by directly observing the amount of time patrons spent viewing the exhibits under the control condition (without supplemental labels) and then again under the treatment condition (with supplemental labels). Study participants were 40 family groups comprised of at least one adult and one child. Average size of the family groups was 4.3 individuals \((N = 172)\). Average time participants spent viewing the exhibit rose from 6.6 seconds under the control condition to 95 seconds under the treatment condition—an increase of 1400%!

Although the Hirschi and Screven (1988) study found a strong treatment effect, the study suffered from significant methodological problems. One mistake the researchers committed was what is sometimes referred to as a Type III Error—getting the right answer to the wrong question. The researchers made no attempt to control for
question phrases on supplemental labels verses statement phrases on supplemental labels. Thus, despite the researchers’ stated purpose, the study was less about the effectiveness of questions and more about the effectiveness of supplemental labels.

Other shortcomings of the Hirschi and Screven (1988) study included limited outcome measures, potential section bias, and possible Hawthorn effect. Outcomes were measured in time only—no attempt was made to measure learning gains. Several museum researchers have argued that time measures alone do not provide adequate information to assess effectiveness of museum experiences (Chiozzi & Andreotti, 2001; Doering & Pekarik, 1997). Hirschi and Screven noted that family groups were randomly selected to participate in their study; however, no mention was made as to how groups were assigned to the treatment and control conditions. If conditions were not alternated throughout the study and families that attended during the first half of the study differed significantly than those attending during the last half of the study, then observed findings could have been influenced by selection bias. It is also possible that visitor behavior was significantly affected by the presence of the researchers. Hawthorne Effect predicts that if research subjects perceived that they are being studied, then they are likely to behave differently than they would otherwise. Under the control condition the subjects might not have been able to guess why they were being observed, but under the treatment condition perhaps the researchers’ intents were obvious. Although overall quality of research methods used in the Hirschi and Screven study could have been better, the study did at least introduce the concept of supplemental labels and indicate that additional research on the subject is warranted.
Summary—Literature Review Phase One

The recent shift in focus from artifact preservation to public education has introduced new challenges for museums. Exhibit labels are key points of contact for museums to communicate with their audiences. To increase effectiveness of exhibit labels is, in effect, to increase the educational value of a museum. Museum researchers have proposed various means of improving new labels (e.g., contrasting colors, questions). However, little consideration has been given to increasing the effectiveness of extant labels. To date, only one published study has investigated increasing readership of extant labels by adding short supplemental labels designed to redirect attention (Hirschi & Screven, 1988). Although Hirschi and Screven found tremendous treatment effect, the validity of the findings was suspect due to mediocre research controls. It was apparent that more research was needed before widespread use of supplemental labels could be recommended.

Phase Two—Studies on Attention

The effectiveness of an exhibit label depends on a museum patron’s ability to attend to and process the information it contains. One of the principal goals of labeling is to increase learning—this makes the issue primarily a cognitive one. Understanding the relevant cognitive processes at work and building on a solid theoretic foundation was deemed critical to developing effective supplemental labels. The remainder of this literature review briefly describes several broad topics of cognitive psychology potentially relevant to supplemental label design. These topics include selective attention,
endogenous influences, exogenous influences, and an integrated model of attentional focus.

Selective Attention

The amount of information that individuals—be they in a museum or anywhere else—can process simultaneously is very limited. Thus, people are able to focus their attention on only a small portion of stimuli in the environment at any given time (Sweller, 1988). As a result, selecting which elements to attend to is a very important issue and one that has been a central topic in cognitive psychology for over half a century with roots going back much farther.

Aristotle considered attention as a narrowing of the senses (cited in Raz, 2004). Today, attention is commonly considered a varied collection of processes that operate to maintain cogent behavior in the presence of irrelevant distractions (Bartolomeo, 2002). Selection is the mechanism whereby resources are directed towards relevant stimuli (Bartolomeo).

The study of selective attention as a discrete discipline can be traced back to Hermann von Helmholtz’s (1866) experiments on visual depth perception and William James’s The Principles of Psychology (1890). Professional discussions about the nature of selective attention date back to at least 1910 (Hicks, cited in Edgell, 1947). Although these early endeavors are noteworthy, they did not stimulate continued interest in selective attention research. Sustained research on the subject did not begin until the early 1950s—first on auditory attention (Broadbent, 1952, 1958; Cherry, 1953; Miller &
Licklider, 1950; Rosenzweig, 1951) and a few years later on visual attention (Averbach & Coriell, 1961; Mertens, 1956; Sperling, 1960; Treisman, 1962, 1969).

*First modern theory of selective attention.* The work of Colin Cherry is regarded as the foundation for most subsequent selective attention research (Eysenck, 2004). Cherry (1953) conducted a series of experiments on the recognition of speech. He found that when test subjects were asked to listen carefully to a specific conversation in a multiconversation environment they could recall very little information about an unattended to conversation. Subjects were able to report the physical characteristics (e.g., female voice) of the unattended to conversation, but not the semantics. Cherry interpreted these findings to mean that unattended information is not processed and that physical differences are used to select the input data to which we attend.

Research methods employed by Cherry (1953) for his speech experiments were very much in the behaviorist tradition. Subjects were regarded as mere “transducers” whose responses were observed when various stimuli were applied. Subject characteristics (e.g., gender, age) were not described; even the number of subjects was not mentioned. Several of the experiments referred to a subject in singular form—alluding that the sample size was likely a single subject. Also not mentioned were any quantifiable data used to draw the conclusions. Rather, phrases like “subject reported very great difficulty in accomplishing his task” were used to deduce impact of altering the independent variables. By today’s standards, reporting of the methods and findings could certainly have been more comprehensive. That said, Cherry’s research methods and reporting style were not inconsistent with behaviorist methods of his time.
Many of Cherry's contemporaries used his research as a starting point to develop even more refined theories of selective attention. Two important theories that built on Cherry's speech experiments were Broadbent's (1958) *filter theory* and Treisman's (1969) *attenuation theory*.

*Filter theory.* Donald Broadbent (1958) put forward his filter theory to address two main issues: (a) the differences between inputs needed for efficient selective attention, and (b) the amount and characteristics of information retained from unattended inputs. The Broadbent model posits that there are two qualitatively different, sequential stages of perceptual processing. In the first stage, "physical" characteristics of incoming stimuli properties (such as the tone or relative location of auditory inputs) are registered for all auditory stimuli, in a "parallel" manner. Parallel processing involves the simultaneous mental indexing of several incoming stimuli. In the second stage, some inputs would undergo higher order cognitive processing (such as semantic identification). Due to the complexity of processing during this second stage, processing capacity is appreciably limited when there are multiple stimuli. Thus, inputs are processed in a "serial" manner. Serial processing is much more limited than parallel processing in that it can only handle one incoming stimuli stream at a time. To prevent an overrun in the second stage, a selective "filter" passes to it only those inputs that have a particular physical characteristic. Broadbent's filter theory predicted that when processing capacity was reached, filtered-out inputs were blocked completely. Only very simple "physical" characteristics could be registered prior to the processing bottleneck.
One of Broadbent’s early studies that contributed to the development of his filter theory was a series of well-designed experiments conducted on synchronous auditory inputs (Broadbent, 1952). Study participants \( N = 54 \) were servicemen of the British Royal Navy. The study dealt with the situation in which two messages arrive simultaneously from the same direction. The messages were presented in two different voices and broadcast via a high fidelity speaker. Both voices on the soundtrack asked a question but only one of the two messages was to be answered. The more subjects were cued as to which message to pay attention to the better they performed. Broadbent concluded that “It seems possible that until attentional selection of one voice takes place none of the components of a babel of voices is appreciably effective in producing response.” In this example, mental resources are focused on figuring out which message should be listened to and the meanings of both messages are lost. Similar findings were later observed in Broadbent’s dichotic listening experiments (Broadbent, 1954, 1957). In dichotic listening, different auditory stimuli are presented in each ear simultaneously.

The Broadbent (1958) filter theory did an excellent job of explaining the results of many studies at the time and quickly became the most widely accepted model of selective attention. However, in the years to follow, findings from several other studies were not well explained by Broadbent’s theory. Other theories emerged to account for the apparent discrepancies. The model that would eventually replace Broadbent’s filter theory was developed by one of his doctoral students, Ann Treisman.
**Attenuation theory.** Treisman’s research broadened the scope of Cherry’s and Broadbent’s research, which had dealt exclusively with auditory inputs, to include visual inputs. Treisman (1969) proposed a substantially revised version of Broadbent’s filter theory in order to accommodate research findings that indicated unattended stimuli were sometimes processed more thoroughly than anticipated. According to Treisman, unattended stimuli might not be completely filtered out from deep processing but rather “attenuated”; that is, the “filtered” sensory signals are not completely blocked, but only weakened. Some inputs from both unattended and attended stimuli would pass to the second stage. Inputs from unattended stimuli would be considerably weaker than those from attended stimuli; so weak that extraction of more subtle characteristics of input, like semantics, might not be possible.

Several years after developing her attenuation theory, Treisman (1977) applied much of what she and other researchers had learned about auditory selective attention to the comparatively less studied field of visual selective attention. The functional equivalent to attenuation theory for visual stimuli is the feature integration theory (Treisman & Gelade, 1980). Feature integration theory distinguished two kinds of visual search tasks: *feature search* and *conjunction search*. Similar to how some simple characteristics of auditory stimuli can be processed pre-attentively (Treisman, 1969), feature search could be performed very quickly and without conscious effort for targets defined by primitive features (Treisman & Gelade). Conjunction search requires deeper processing and is performed in serial fashion for targets defined by a conjunction of primitive features. Treisman and colleagues (Treisman, 1991; Treisman & Schmidt,
ascertained that color, orientation, intensity, and other primitive features could be used effectively in feature searches.

Treisman and Gelade's (1980) feature integration theory was supported by findings from research on preattentive processing of separable visual features (Treisman & Souther, 1985). It was found that participant search times for a target among distractors varied dramatically depending on whether a particular feature was either present or absent. A key finding of Treisman and Souther's study was that average search times to find a circle intersected by a line was independent of the number of regular circles in the distractor field. This was not the case when the target was a regular circle among a field of circles with lines, which found that search times increased linearly with the number of distractors. This model of performance implies feature search (parallel processing) when the target had a unique distinguishing feature and conjunction search (serial processing) when the target was distinguished by the absence of a feature present in all the distractors. Research methods used in the five experiments of Treisman and Souther (1985) were, for the most part, well thought out and well described. Research subjects were 42 university students. It was unclear if subjects participated in more than one experiment—if they did, possible testing effects could have occurred as subjects 'got wise' to the experimental conditions.

Implications for museums. For museum educators, cognitive psychology can provide a framework for describing and developing improved ways of communicating with museum audiences. Findings from Cherry's (1953) listening tasks and Broadbent's (1958) filter theory experiments suggest that museum patrons can only attend to one stimulus stream at a time. Although, Treisman's (1969) attenuation theory does suggest
that some nonattended to stimuli might not be filtered out entirely. Treisman and Gelade’s (1980) feature integration theory predicts that “primitive” features in the visual environment can be perceived pre-attentively. It might therefore be possible for museum patrons who are actively looking at an object of interest to also perceive other features in the visual environment. Treisman and Souther’s (1985) research on pre-attentive processing of features further suggest that visual objects are more easily noticed when they introduce a unique featureal element rather when they omit a common featureal element. Identifying other components of the visual environment that are likely to attract attention is the next logical step in understanding how individuals, museum patrons included, allocate their limited attentional capacity.

Influences on Selective Attention

It is currently theorized that two complementary mechanisms control selective attention; namely, *exogenous influences* and *endogenous influences* (Berger, Henrik, & Rafal, 2005; Folk, Leber, & Egeth, 2002; Gibson & Kelsey, 1998). When attentional focus is driven by characteristics of the visual field that are independent of an observer’s goals and beliefs, attention is under exogenous control. When attentional focus is directed to regions or objects in the visual field influenced by a set of internal goals and beliefs, attention is under endogenous control. Exogenous influences cannot be consciously suppressed, are not memory load contingent, and do not require active awareness. Whereas, endogenous influences are easily suppressed, subject to memory load overrun, and require active awareness. Findings from studies on how attention processes are
affected by exogenous and endogenous influences were used to inform design elements of the supplemental labels used in the present study.

Exogeneous influences. “Sudden stimuli and sudden changes of stimulus exert a familiar influence upon attention” (Titchener, 1908, p. 192). This form of attentional influence is now more often referred to as exogenous, or bottom-up. Numerous researchers in the modern era have speculated on the nature of exogenous influences and why particular objects in a visual search field capture attention involuntarily.

An example of exogenously influenced selective attention is when attention is directed to elements in a visual scene that significantly differ from their surroundings. This phenomenon was studied by Duncan and Humphreys (1989) through a series of four-well described experiments investigating the affects of stimulus similarity on visual search tasks. Research subjects ($N = 20$) were between the ages of 19 and 35 drawn from a paid panel of the Applied Psychology Unit of Cambridge, England. Although sample sizes were small, averaging only 5 subjects per experiment, the researchers found statistical significance for nearly all of their analyses. Collective findings from the experiments indicated that search tasks increased in difficulty as similarity of targets to nontargets increased. Search difficulty also increased as similarity between nontargets decreased.

Findings from Duncan and Humphrey's (1989) visual search experiments support the view that without any conscious effort individuals are able to distinguish unique elements in the visual field—usually referred to as feature singletons (Theeuwes & Godijn, 2002). Features are elemental units of perception (e.g., color, physical orientation) that require very little, if any, conscious processing. Virtually any relatively
scarce feature of a visual scene could be registered as a singleton. A unique color, for
instance, can capture attention even when its relationship to a search target is unknown.

An exemplar of color singleton research was conducted by Folk, Remington, and
Johnson (1992) in four experiments on involuntary orienting of selective attention. Folk
and colleagues described in detail the particulars of their research design and participant
characteristics. Each experiment contained approximately 35 participants drawn from a
paid volunteer pool at NASA-Ames, or undergraduate students from Villanova and
Syracuse universities who participated to partially fulfill a course requirement. Not
mentioned is how participants were assigned to control and treatment conditions, which
hints at the possibility of selection bias. The experiments involved providing subjects
valid and invalid visual cues as to the location of a specific target. Influence from color
on search task efficiency was measured and analyzed. It was shown that conditions exist
in which static discontinuities (color singletons) do involuntarily capture attention.

Similar findings have been identified by several other researchers (Cave & Wolfe, 1990;
Koch & Ullman, 1985; Parkhurst, Law, & Niebur, 2002). For instance, data from
research by Turatto and Galfano (2001) shows that color can elicit automatic orienting by
default when an observer has no particular intention with regard to the observed stimuli.

Color is, of course, but one feature dimension in which singletons can occur.
Several researchers have shown that shape singletons can have comparable effects on
selective attention (Baldi & Itti, 2005; Berlyne, 1958; Theeuwes, DeVries, & Godijn,
2003). Theeuwes in particular has extensively researched the influence that feature
singletons, including shape singletons, have on attention (Theeuwes, 1990, 1992, 1995,
2005).
In one such study, Theeuwes (1992) tested the perceptual selectivity of color and shape by means of three visual-search experiments measuring whether the pre-attentive parallel stage of visual stimuli processing can selectively guide the attentive stage to a particular known-to-be-relevant target. Specifically measured were the effects of irrelevant distracter singletons on target searches. Research methods, as described, appeared robust and free from significant threats to validity. Eight different paid volunteers were randomly assigned to control and experimental conditions for the three experiments \((N = 48)\). Findings from the experiments implied that singleton distinctiveness relative to the target was a critical factor in determining whether or not a particular singleton captured attention. Theeuwes observed that when shape singletons were more salient than color singletons (by increasing the relative distinctiveness between targets and distractors for shapes and decreasing the distinctiveness for colors), shape singletons could successfully capture attention.

Abrupt onset singletons (elements that have changed position or luminance) have also been shown to be very effective in capturing visual attention. Jonides and Yantis working together and separately (Jonides, 1981; Jonides & Yantis, 1988; Yantis 1996; Yantis & Jonides, 1984) as well as other researchers (Fick & Byrne, 2003; Miller, 1989; Remington, Johnston, & Yantis, 1992; Todd & Van Gelder, 1979) have investigated exogenous influences on attention brought about by abrupt onset. Yantis and Jonides (1984) proposed that influence on selective attention from abrupt onset stimuli was almost absolute. The hypothesis that abrupt visual onsets capture attention automatically was tested by Yantis and Jonides (1990) in four experiments. Participants were recruited from Johns Hopkins University and the University of Michigan, and were either paid or
received class credit. Participants were randomly selected to groups. There were no serious threats to validity apparent in the reported study methods. Reactions to stimuli and latency in locating target objects among distractors were assessed by monitoring participant eye positions. Effects of abrupt onset were measured under varying degrees of attentional focus. The researchers found that the visual attention system is eminently prepared to “give high priority to abrupt onsets when in diffuse attention mode” (Yantis & Jonides, 1990, p. 133). However, the researchers concluded that abrupt onsets did not necessarily capture attention when subjects were in a highly focused attentional state.

Several other studies on visual attention have also produced findings that are discordant with exogenous only models of attentional capture (Bacon & Egeth, 1994; Folk & Remington, 1998; Gibson & Kelsy, 1998; Simons & Chabris, 1999; Treisman, 1988). Findings from these studies indicate that attentional capture can be modulated by deliberate intentions of the observer, referred to as endogenous influences.

Endogenous influences. Endogenous, or top-down, influences refer to the degree to which a set of feature attributes are consistent with the current attentional set of the individual. Endogenous attention refers to directing of attention under control of the individual (Pattyn & Soetens, 2004). Research has shown that when subjects are provided with specific knowledge of task demands, attentional focus is guided to only those locations that have the target-relevant feature (Gibson & Jiang, 1998; Kaptein, Theeuwes, & Van der Heijden, 1995; Wolfe, Butcher, Lee, & Hyle, 2003). For instance, Treisman (1988) investigated the effects prior knowledge of the dimension (e.g., color, shape) in which a target would be presented in could have on target search latency. Three experiments involved having participants ($N = 8$) search for known or unknown targets...
differing from the distractors either in color or orientation. It was found that the search process was indeed significantly sped up when subjects knew the dimension of the target (whether it would be a unique color or a unique shape). Thus, the endogenous priming expedited the search process by effectively reducing the number of distractors. Although findings from Treisman’s experiments are intriguing, reporting of study methods was minimal at best. Treisman presented the experiments as part of a lecture on her recent research and theories. Not mentioned were participant characteristics, selection and assignment procedures; descriptive statistics beyond mean times; $t$ scores, $p$-values or any other statistical analysis outputs; and method of measuring and recording outcomes.

It has been observed that under certain circumstances, endogenous influences on attentional focus can be so dominant that they cannot be superseded by even highly salient exogenous stimuli. Some recent studies of attentional capture found that, quite often, observers who are focused on an object fail to notice another unexpected salient object—a phenomenon termed “inattentional blindness” (Simons, 2000). Simons and Chabris (1999) demonstrated that when subjects were cued to pay attention to one “storyline” of a video segment, many were completely oblivious to what was taking place in another storyline. Study participants were asked to pay close attention to a 75-second video sequence of six individuals playing a mock game of 3-on-3 basketball. About half way through the video, either a woman holding an open umbrella or a woman in a gorilla suit walked through the scene. The unexpected event was superimposed on the film (transparent condition) or all action was filmed together (opaque condition). Out of the 192 Harvard undergraduate student observers across all conditions, only about half (54%) reported noticing the unexpected event. Simons and Chabris interpreted these findings as
revealing a substantial level of sustained inattentional blindness for a dynamic event...” (p. 1068). Research protocols and methods were commendably described. Participant characteristics and exclusion criteria were thoroughly outlined as were procedures used to create the experimental conditions and measure the outcomes. All details necessary for other researchers to replicate the study were provided.

Another example of endogenous dominance of selective attention was demonstrated by Nikolic, Orr, and Sarter (2004), who asked subjects to perform an externally paced task while trying to detect flashing lights on a visual display. The participants’ (9 men and 7 women students of Ohio State University) primary task was to play a game of Tetris on one video display and detect targets that appeared in an adjacent display. Although the flashing target boxes always appeared in the same locations on the adjacent display, subjects often failed to notice the targets. Research methods used in the study appear to have been thoughtfully conceived and concisely described. The researchers suggested that findings from their study help explain why pilots on modern flight decks sometime miss changes in status and behavior of their automated systems, even those involving abrupt onset signals. Thus, it appears that although salient objects can attract attention, their affect is moderated and at times overridden by endogenous influences.

**Integrated model of attentional focus.** For several years, researchers investigating exogenous influences on attention and those investigating endogenous influences worked in isolation from each other. Both ideological camps were able to cite solid research that substantiated their position while discrediting their opposition. In recent years, a more holistic view of attention has emerged that incorporates an interplay between both top-
down behavioral goals of the observer and bottom-up properties of external stimuli. Ruz and Lupiáñez (2002) conducted a review of attentional capture literature spanning over a hundred years of research from James in the 1890s to Theeuwes in the 1990s. In all, 60 sources were reviewed. Conclusions reached by Ruz and Lupiáñez were consistent with exogenous driven models in that attentional capture appears to be automatic "by default" occurring in the absence of a specific mental set. However, it was also clear to Ruz and Lupiáñez that attentional capture can be modulated by internal influences.

Nearly every contemporary visual search model proposes that the guidance of attention is determined by interactions between bottom-up stimuli and top-down perceptual sets (Chun & Wolfe, 2001). A good example of an integrated model of visual attentional capture is the contingent involuntary orienting hypothesis, which states that a featural property will capture attention only when it matches endogenous control settings (Folk et al., 1992). Individuals tend to rapidly habituate to exogenous influences unless they are consistent with endogenous influences. If task demands require a high degree of attentional focus, then exogenous stimuli might fail to capture attention. However, if task demands are low or exogenous stimuli are consistent with endogenous control settings, then exogenous stimuli will likely capture attention. Folk and colleagues developed their theory of attentional capture after reviewing findings from several studies on exogenous and endogenous influences. Although the exact number of studies reviewed was not mentioned, 40 different sources were referenced by Folk et al. in the section describing development of their theory. The contingent involuntary orienting hypothesis model of visual attention allocation is consistent with several other recent research findings and theories (e.g., Gibson & Jiang, 1998; Wolfe, 1994; Yantis, 1998).
Summary—Literature Review Phase Two

Key findings from early modern-era researchers confirmed earlier speculations that individuals have only limited attentional capacity and objects that successfully capture attention receive almost exclusive use of available cognitive resources (Broadbent, 1958; Cherry, 1953; Treisman, 1969). These findings have since been confirmed by numerous other researchers (e.g., Itti & Koch, 2001; Koch & Ullman, 1985; Simons, 2000; Yantis, 1998). Recent models of selective attention suggest that in order for featural elements, including highly salient singletons, to consistently capture visual attention they must also be consistent with endogenous priorities (Folk et al., 1992).

Selective attention theories are highly applicable to museum practice by providing insights into the mechanisms that drive how patrons allocate their attention. For supplemental labels to be effective they must capture visual attention and they must be consistent with internal motivations of the patron. The present study investigated the effectiveness of supplemental labels that were designed to be visually salient (exert exogenous influences) and facilitate guided learning (tap endogenous influences) by redirecting attention to informative extant labels.
CHAPTER III

METHODS

Purpose

The purpose of the present research was to determine the extent to which supplemental labels would affect readership of select extant exhibit labels of the Utah State University Museum of Anthropology (USU Museum). The study’s primary objectives were to determine whether or not supplemental labels would encourage patrons to read and remember more information from target extant exhibit labels, and to determine if the presence of supplemental labels would affect patron attitudes. It was anticipated that findings from the study could help inform museums on how to better communicate with their audiences through written text.

Hypotheses

It was hypothesized that the presence of supplemental exhibit labels on select exhibits would positively affect visitor behavior, knowledge retention, and attitudes. Seven specific a priori hypotheses were set forth for this research. Data for the first hypothesis were collected via video observations; data for the other six hypotheses were collected via an experimenter-developed postvisit questionnaire (see Appendix A).

Behavior-Related Hypotheses

1. Engagement hypothesis: The average time patrons spend viewing each of the three target exhibits will increase under the treatment condition relative to under the control condition.
2. Viewership hypothesis: The number of patrons that visit the target exhibits, relative to the number of patrons that visit nontarget exhibits, will increase under the treatment condition relative to under the control condition. In other words, when supplemental labels are in place, fewer patrons are expected to pass by the target exhibits without stopping.

Knowledge-Related Hypotheses

3. Question-answer hypothesis: Average retention of information contained in target extant labels that reference answers to questions posed on supplemental labels will increase under the treatment condition relative to under the control condition.

4. Target label hypothesis: Average retention of information contained in target extant labels that is presented after answers to questions posed on supplemental labels will increase under the treatment condition relative to under the control condition. This hypothesis predicts that patrons will continue reading target extant labels even after they reach the answers to a questions posed by the supplemental labels.

5. Halo effect hypothesis: Average retention of information contained in nontarget extant labels will increase under the treatment condition relative to under the control condition. This hypothesis predicts that patrons will be more likely to read even nontarget labels when supplemental labels are in place.

Attitude-Related Hypotheses

6. Museum satisfaction hypothesis: Average overall attitudes about the museum will increase under the treatment condition relative to under the control condition. This
hypothesis predicts that the supplemental labels will facilitate a more enjoyable museum experience.

7. Labels satisfaction hypothesis: Average attitudes about the exhibit labels in the museum will increase under the treatment condition relative to under the control condition. If, however, attitudes about the labels under the treatment condition are significantly lower than under the control condition, then this could indicate that patrons are annoyed by the supplemental labels.

Research Design

The study used an experimental design to investigate how supplemental exhibit labels affect the behavior, knowledge, and attitude of museum patrons. Under the control condition the museum was unchanged from its pre-experiment condition. Data collected from patrons who experienced the museum under the control condition served as a baseline for data collected under the treatment condition. The following sections describe elements of the research design relating to participants, setting, independent variables, and dependent measures.

Participants

Everyone meeting the inclusion criteria and not excluded by the exclusion criteria that visited the USU Museum of Anthropology during the study timeframe was asked to fill out an exit questionnaire. Inclusion criteria was all undergraduate students currently attending USU. Excluded from the study were those that worked for the museum, chose not to participate, or had participated in a previous phase of the study.
The research population was drawn from a diverse cross section of undergraduate students attending Utah State University in Logan, Utah during fall semester 2006. As shown in Table 1, participants under both control and treatment conditions were typically Caucasian \( (n = 118) \) and first-time visitors to the museum \( (n = 89) \). Of the 126 individuals that participated in the study, 3 in the control group and 1 in the treatment group chose not to fill out demographic information.

Prior to conducting the study, a sample size estimate was calculated, and participant recruitment materials were created and distributed. These participant-related issues are discussed below.

*Sample size.* It was projected that a minimum of 50 participants would need to be recruited for the study. This sample size was based on pilot study data and an estimated minimum level of practical significance. A convenience sample of individuals \( (n = 10) \) who visited the museum under control conditions during the pilot study scored 48% correct on target items and 40% overall on the multiple-choice postvisit questionnaire used in the present study. To determine a minimum level of practical significance for the study, expert advice and general rules of thumb for social science research were considered. The director of Utah State University’s Museum of Anthropology, who is also a professor at Utah State University, suggested that a minimum level of practical significance for the present study should be to raise average scores up to at least an academic level of passing. In other words, to be considered successful, the supplemental labels would need to raise scores on target items from 48%—an “F,” to at least 65%—a solid “D.”
### Table 1

**Number of Participants in Demographic Subgroups**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control group</th>
<th>Treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First time visitor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>47</td>
<td>42</td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>35</td>
<td>19</td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
<td>37</td>
</tr>
<tr>
<td><strong>Year in school</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td>Sophomore</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Junior</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Senior</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Caucasian/white</td>
<td>65</td>
<td>53</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Mixed/other</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>College major</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological sciences</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Business</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Education</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Engineering</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>History/political science</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Humanities</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Social sciences</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Undecided/undeclared</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total # of participants</strong></td>
<td>66</td>
<td>56</td>
</tr>
</tbody>
</table>

Pilot data indicated that a raise in scores of 17% was approximately .85 of a standard deviation. Eight tenths of a standard deviation or more is generally considered “large” in social science research (Cohen, 1988, 1992). Sample size calculations
indicated that to detect an effect size .85 of a standard deviation with alpha set at .05 and power at .80, the minimum number of subjects per group needed to be at least 22. To be on the safe side, it was decided that no fewer than 25 subjects per group ($N = 50$) would be recruited for the study. Fifty participants would provide enough statistical power to detect a change in effect size of .80 or more (the minimum threshold for a "large" effect). Recruitment efforts resulted in 66 participants in the control group and 56 participants in the treatment group, which was more than twice the necessary minimums.

**Subject recruitment.** Recruitment to the study involved distributing invitation fliers to approximately 550 students who were attending the following courses: Advanced Painting Studio, Global Marketing Strategy, Marketing Research, Painting I, Practicum in Improvement of Instruction, Science of Sound, Teaching Science and Practicum, Watercolor Painting, and World Archaeology. The invitation flier briefly described the USU Museum of Anthropology and how to get there, see Appendix B. In addition to general information about the museum, the flier also mentioned that each visitor to the museum would be entered in a drawing for a Video iPod.

**Setting**

The Utah State University Museum of Anthropology is housed on the second floor of the renovated Old Main building on the campus of Utah State University in Logan, Utah. The USU Museum of Anthropology was selected as the study site for several reasons. It has many (about 20) traditional glass-case style exhibits that each contain several artifacts/objects and accompanying descriptive labels. The museum’s relatively small size (approximately 2,000 square feet of exhibit space) minimizes the
potentially confounding influence of museum fatigue. And, it was conveniently located for the research population (USU undergraduate students).

Of the 20 exhibits in the museum, the three that were in the clearest line of sight from the museum’s security cameras were selected as the target exhibits for the present research. These were the exhibits to which the supplemental labels were attached under the treatment condition. All three target exhibits were similar in size and mode of presentation. Each of the glass case-type exhibits were about 6-feet tall by 8-feet wide by 2-feet deep and contained static artifacts/objects accompanied by several descriptive labels. The target exhibits differed from each other in thematic content. Themes addressed by the three exhibits were Native American Baskets, Ancient Egypt, and Otzi the Iceman.

In addition to the three target exhibits, two nontarget exhibits were also part of the study. At no time during the study did the two nontarget exhibits have supplemental labels. One of the nontarget exhibits was similar to the three target exhibits and contained items from the Dogon people of North Africa. The central feature of the other nontarget exhibit was a 4-foot tall glass case containing pottery created by the artisan Maria Martinez.

*Independent Variable*

The independent variable for the present study was presence or absence of supplemental labels. Two supplemental labels were developed for each of the three target exhibits, for a total of six supplemental labels. Supplemental labels were displayed under the treatment condition, but not under the control condition. Pursuant to accomplishing
intended outcomes, supplemental labels were designed to capture attention using visual attributes that would leverage exogenous and endogenous influences on attention.

*Attract attention.* The first step in connecting with exhibit label readers was to attract their attention. Research on exogenous influences, attentional capture, and saliency indicated that features in the environment more likely to get noticed were those that differed from their surroundings in color (Parkhurst et al., 2002) and/or shape (Theeuwes et al., 2003). Additionally, museum studies research has shown that visually isolated elements can attract attention (Melton, 1972). Thus, supplemental labels were designed to stand out from their surroundings by differing from other elements in the museum in their color (yellow background instead of white), shape (oval instead of rectangle), and placement (attached to the inside of the front glass of an exhibit). Each of the supplemental labels contained no more than 12 words. The purpose of the supplemental labels was not to supplant extant labels by providing additional information; rather, it was to stimulate an interest in reading target extant labels.

*Tap internal interests.* Evidence from studies of selective attention suggests that features in the environment that capture attention continue to do so only if the features identify items consistent with internal intents of the individual (Folk et al., 1992; Gibson & Jiang, 1998). For the supplemental labels to be successful, not only must they capture visual attention but they must also be consistent with a patron's endogenous motivations. Some museum studies research has found that when patrons are given direction as to what they should be looking for in an exhibit, they are likely to search out that information (Bitgood, 2000). Other findings indicate that prominently placed questions in exhibit labels can be useful in encouraging label reading (Litwak, 1996; Screven, 1975).
Therefore, all text on supplemental labels was phrased as brief, guiding questions. See Appendix C for actual size copies of supplemental labels used in the study. Text for each of the six supplemental labels read as follows:

- What do you think the purse-shaped Jump Dance basket contains?
- Do you know why conifer root was used to make this basket?
- What was found during a recent examination of the Iceman?
- What do the lines on the Iceman’s teeth indicate?
- Who was Anubis and what was he often shown as?
- Do you know what the purpose of a Ka-Statue was?

Answers to the questions posed on the supplemental labels could be found in nearby extant exhibit labels.

**Dependent Measures**

Seven quantitative dependent measures were used to determine the effects of the supplemental labels: two measures of viewing behavior, three measures of knowledge retention, and two measures of attitude. Where appropriate, group means were compared using independent samples $t$ tests and differences were expressed as standardized mean difference effect sizes calculated using Glass’ delta (Glass, 1976), a commonly used measure of effect size in the social sciences (Rosenthal, 1994). In all cases, treatment effects were also converted to percentage point gains/losses, as is common practice in museum studies (e.g., Bitgood & Cleghorn, 1994; Hirschi & Screven, 1988; Litwak, 1996). Additionally, information about patron year-in-school, ethnicity, gender, college
major, and whether they were a repeat visitor was collected for possible subgroup analysis. No individually indentifiable information was collected.

**Viewing behavior.** The first step in measuring the effectiveness of supplemental labels was to determine if visitors even noticed them. Therefore, the primary outcome measure of the study was shifts of selective attention as measured by changes in viewing behavior. The two behavior-related dependent variables were time spent viewing the target exhibits and number of patrons who viewed the target exhibits relative to the number of patrons who viewed two nontarget exhibits. The variables were assessed via video observations and an experimenter-developed, postvisit questionnaire.

Time stamping on the video footage obtained from the museum’s three security cameras was used to assess how long participants spent at each of the target exhibits. Frame rate for the cameras was about one frame per second. Several observation protocols were developed for coding the video footage. Patrons were deemed actively viewing an exhibit if they were in view of a surveillance camera *and* were facing one of the target exhibits. If a patron turned away from an exhibit for only one video frame, then the time count was not stopped. If a patron turned away for more than one frame before turning their attention back to an exhibit, then the amount of time spent turned away was subtracted from the time count. Conversely, if a subject only viewed an exhibit for one video frame, then no time was recorded for that individual at that exhibit. At least part of a visitor’s head had to be visible to indicate direction of gaze. If a patron approached from behind a target exhibit, then both eyes had to be forward of the exhibit’s front pane of glass before the time count was started. In addition to time spent viewing target
exhibits, patron gender was noted during the video coding process for possible subgroup analysis.

To ensure that no experimenter bias had been introduced during the coding process and to demonstrate that coding was consistent, a randomly selected portion of time scores recorded by the researcher was compared against time scores from the same time sequence coded by a research assistant blind to the experimental condition. The randomly selected time sequence for scores comparison was from 12:00 p.m. to 3:30 p.m. on September 29, 2006, which included both treatment and control conditions. Figure 1 graphically illustrates that time scores coded by the researcher and time scores coded by the research assistant were highly correlated \((r = .95)\), and exceeded the a priori established minimum interclass correlation \((r = .70)\).

![Figure 1. Plot of research assistant time scores over primary researcher time scores.](image-url)
Data informing whether patrons visited the target exhibits more than nontarget exhibits were collected via postvisit questionnaires rather than video footage. Video observations recorded only those individuals that visited the three target exhibits—not observed were those who visited nontarget exhibits. Items 1, 7, 10, 16, and 19 of the questionnaire (see Appendix A) asked patrons to indicate whether or not they remembered visiting a specific exhibit. Three of the items referenced the three target exhibits, and the other two items referenced two nontarget exhibits. Under treatment and control conditions the average number of patron visits to target exhibits was compared against the average number of patron visits to nontarget exhibits. If the supplemental labels were effective in capturing the attention of patrons who would have otherwise passed by without stopping, then the ratio of target exhibit visitors to nontarget exhibit visitors would increase.

Instrument development. Data for the knowledge-related dependent measures and the attitude-related dependent measures were obtained from the same postvisit questionnaire used to measure the number of visitors to target and nontarget exhibits (see Appendix A). Development of the questionnaire was consistent with best practices advocated by Dillman (1978, 2000) and others (e.g., Frary, 1996; Grunland, 1993; Scherpenzeel & Saris, 1997). Specific recommendations that were incorporated into the data collection instrument for the present study included keeping questionnaire length relatively short, locating items that ask for personal (demographic) information at the end of the questionnaire, ordering Likert Scale (Likert, 1932) items from the lowest level to the highest level, verifying the content validity of the items, calculating reliability of the
scores, and obtaining feedback on the initial list of items from a representative sample of potential responders.

The first draft of the postvisit questionnaire contained 24 items relating to information contained in extant labels of the three target exhibits. Based on feedback from the dissertation committee for the present research, some items relating to nontarget exhibits and photos of each referenced exhibit were added. During follow-up conversations with dissertation committee members, it was recommended that some items specifically relating to the supplemental labels be added to the questionnaire. The final version of the 2-page instrument contained 15 items relating to information contained in the three target exhibits, and four items relating to information contained in two nontarget exhibits. All items were multiple choice. An alternate form of the questionnaire (containing the same items in different order) was created to reduce the chance of participants copying responses from each other. Content validity of knowledge-related items used on the final version of the questionnaire was verified by the coordinator of the USU Museum of Anthropology.

Pilot study. Prior to initiating the present study, a small pilot study was conducted. Findings from the pilot study were used to inform decisions about postvisit questionnaire development and administration. Clarity and difficulty of individual items were assessed during the pilot phase by administering the instrument to 10 individuals who had never visited the museum. Items of low quality (confusing or too easy) were removed and new ones added. The questionnaire was then administered to eight individuals who visited the museum under control conditions (no supplemental labels) and 12 individuals who visited the museum under treatment conditions (supplemental labels in place). To assess
whether scores on the questionnaire were reliable, Cronbach’s alpha was computed. The alpha for the 19 knowledge-related items under the control condition was .85 and under the treatment condition was .84, which indicated scores on the items had good internal consistency reliability.

During the pilot study, it was observed that if the postvisit questionnaire was administered to participants just inside the entrance to the museum, then some participants would attempt to return to the targeted exhibits to fill out the questionnaire. However, if the questionnaire was administered immediately outside the museum entrance, then participants did not attempt to re-enter the museum to fill out the questionnaire. Thus, it was apparent that during the full study the questionnaire would need to be administered outside the museum entrance.

Knowledge-related items. Items on the questionnaire designed to measure knowledge gain can be categorized into three different dependent measure classes: Class A items answered questions posed on the supplemental labels, Class B items referenced information that occurred after the text answering the question posed on the supplemental labels, and Class C items would have required reading of nontarget labels (labels to which the supplemental labels did not refer). An example of a supplemental label question for the Iceman exhibit was “What was found during an examination of the Iceman’s body in 2001?” The corresponding Class A item was “During an examination of the Iceman’s body in 2001, scientists discovered....” The Class B item for the same target extant label was “Initially scientists believed the Iceman died due to exposure to the cold; they now believe he....” And, the Class C item for the Iceman exhibit was “Scientists estimate the Iceman’s age to be around....”
Of the three knowledge-related dependent measures of the present study, the one reasoned most likely to be confirmed was the Class A items dependent measure. The six items on the postvisit questionnaire used to test this dependent measure were near verbatim versions of the questions on the six supplemental labels. The specific items were numbers 2, 5, 11, 14, 20, and 23. Patrons who read the supplemental label questions and found the answers in the extant exhibit labels would have been exposed to the information tested by the Class A items dependent measure.

Data used to test the Class B items dependent measure were participant responses to items on the questionnaire that referenced information presented towards the end of target extant labels. The specific items from the questionnaire used to test this dependent measure were numbers 3, 6, 12, 15, 21, and 24. Patrons who kept reading target exhibit labels beyond the answers to supplemental label questions would have been exposed to the information tested by this dependent measure.

Data used to test the Class C items dependent measure were participant responses to seven items on the questionnaire that referenced information presented in nontarget labels of target exhibits and nontarget exhibits. The specific items from the questionnaire used to test this dependent measure were numbers 4, 13, and 22 (which related to information presented in nontarget labels of target exhibits), and numbers 8, 9, 17, and 18 (which related to information presented in labels of two nontarget exhibits). All information tested by this dependent measure was contained in nontarget labels; consequently, patrons would have had to read several nontarget labels to be exposed to the information tested by this dependent measure.
Family-wise Type I error during primary analysis of the three knowledge-related dependent measures was kept in check using methodological controls instead of adjusting alpha levels or applying some other statistical control. It was decided a priori that the three knowledge-related dependent measures would be analyzed sequentially. If statistical significance was found for Class A items, then analysis would proceed to Class B items. If statistical significance was found for Class B items, then analysis would proceed to Class C items. Each level of analysis, in effect, was protected by the preceding level of analysis.

The knowledge-related items on the questionnaire were organized by exhibit. The 15 items relating to the three target exhibits were clustered into three groups of five (one cluster per exhibit); the four items relating to two nontarget exhibits were paired into two groups of two (one pair per exhibit). Items 1 and 4 of the five knowledge-related items per target exhibit were Class A items, items 2 and 5 were Class B items, and item 3 was a Class C item. See Figure 2 for illustration of where information referenced on the questionnaire was located in the target exhibits. All four of the items for the two nontarget exhibits were, of course, Class C items.

**Attitude-related items.** In addition to collecting quantitative data about changes in behavior and knowledge, the questionnaire collected quantitative and qualitative data about changes in attitudes towards the USU Anthropology Museum and its exhibit labels. The first dependent measure of attitudes assessed patrons’ overall satisfaction with the museum and was comprised of three 9-point Likert scale items—specific items used were numbers 25, 26, and 27. The other dependent measure of attitude assessed the level of patron satisfaction with exhibit labeling. Under the treatment condition this would have
Figure 2. Location of information referenced in questionnaire.

included the supplemental labels. The two-exhibit label attitude items that comprised the labels dependent measure also employed a 9-point Likert scale—specific items used were numbers 28 and 29. Patron reactions to the supplemental labels were further assessed by the questionnaire via three descriptive items and one open-ended item. An example of a descriptive item was “How many yellow oval labels did you notice?” The open-ended item read, “Please tell us what you think about the yellow oval labels, why you did or didn’t read them, their helpfulness, etc.”

Procedures

Procedure-related factors that could potentially influence findings were considered prior to initiating the present study. Careful consideration was given to
protocols for administering the questionnaire, and method of assigning subjects to groups. These two topics are discussed below.

**Questionnaire Administration**

To facilitate administration of the postvisit questionnaire, the researcher set up a small table in front of the USU Museum’s entrance. Prior to entering the museum, visitors were instructed by the researcher to visit the museum for as long as they wanted and on exiting they would be asked to fill out a survey and an entry form for the iPod give-away. All patrons were given the same instructions. The researcher remained outside the museum for the duration of the study so as to avoid any chance of biasing patron behavior. The only exception to this was once each day when the researcher entered the museum to change the experimental condition by installing or removing the supplemental labels.

Approximately 75% of the research participants visited the museum alone; the other 25% visited with one or more other patrons. Average length of stay in the museum was about 30 minutes. Patrons then spent approximately 12 minutes filling out a postvisit questionnaire. Questionnaires were administered outside the entrance of the museum where none of the exhibits referenced on the questionnaire could be seen. Alternate forms of the questionnaire were created to reduce the chance of participants copying responses from each other. To minimize the chance that participants might tell their classmates (who had not yet visited the museum) about the nature of the study, patrons were not informed of the purpose of the study or whether they had participated in the control or treatment condition.
Assignment to Groups

To keep research conditions as naturalistic as possible, no attempts were made to regulate when participants would visit the museum during the research timeframe (September 25-29, 2006). Neither were participants required to visit the museum for a specific length of time. Rather, patrons self-selected when they would participate and for how long. All visitors in the museum at any given time experienced the museum under the same condition. Visitors did not know which condition they were participating under, or even that there were two different conditions. To control for possible unequivalent samples due to time of day and day of week attendance variations, conditions were switched every day at 1:00 p.m. throughout the study. Roughly equal numbers of visitors participated under the treatment condition \((n = 57)\) as did under the control condition \((n = 69)\).
CHAPTER IV
RESULTS

The present study utilized several dependent measures to assess the impact of supplemental labels on patron behavior, knowledge retention, and attitudes. Data used to test the dependent measures were derived from video recordings and an exit questionnaire. Unless otherwise indicated, the Type I error for all analyses was set at 5% ($p \leq .05$). This chapter is organized around the results of the quantitative dependent measures and qualitative data derived from patron comments.

Analysis of Changes in Behavior

This section presents data from the current study relating to possible effects of supplemental labels on patron behavior. First, the average amount of time patrons spent viewing the three target exhibits under control and treatment conditions was compared. Then, the average number of patrons that viewed the three target exhibits under control and treatment conditions was compared.

Behavior Dependent Measure #1

The amount of time patrons spent viewing target exhibits was analyzed by comparing mean time scores of patrons under control and treatment conditions. Time scores were computed for each individual at each of the three target exhibits. Prior to comparative analysis, the distribution of time scores was graphically plotted, as shown in Figure 3. Due the skewed distribution of the time score data, the data were transformed using a base 10 logarithm prior to performing comparative analysis. Logarithmic
Figure 3. Distribution of time spent viewing the three target exhibits.

transformation is recommended for analysis of positively skewed data (Howell, 2002; Moore & McCabe, 2003); this is done to make the data more normally distributed and reduce influence from outliers.

Descriptive statistics and an independent samples $t$ test were calculated from the time scores, see Table 2. Outcomes were converted to standardized mean difference effect sizes using Glass’s delta (Glass, 1976), and percentage point gains/losses. The independent samples $t$ test was calculated from base 10 logarithmic transformed time scores. The combined sample sizes under the control condition ($n = 164$) and the treatment condition ($n = 152$) do not represent unique patrons but rather are the summed total of patrons visiting each of the three target exhibits. Most patrons visited more than one target exhibit during their stay in the museum and thus were counted more than once.
Table 2

Descriptive Statistics and Independent Samples t-Test Results for Number of Seconds Participants Spent Viewing Target Exhibits

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
<th>M</th>
<th>Mdn</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Δ</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>164</td>
<td>70</td>
<td>37</td>
<td>81</td>
<td>-1.114</td>
<td>314</td>
<td>.266</td>
<td>.21</td>
<td>24</td>
</tr>
<tr>
<td>Treatment</td>
<td>152</td>
<td>87</td>
<td>47</td>
<td>128</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Visual inspection of the distribution of time scores suggests that, on average, patrons who visited the target exhibits under the treatment condition ($M = 87$, $Mdn = 37$, $SD = 128$) might have done so for slightly longer than did patrons who visited the target exhibits under the control condition ($M = 70$, $Mdn = 47$, $SD = 81$). However, this observed difference between the means was not significantly different ($p = .266$). Thus, the finding is not consistent with the engagement hypothesis that predicted patron time scores would significantly rise under the treatment condition.

Behavior Dependent Measure #2

The effectiveness of the supplemental labels in attracting patrons was assessed by comparing the number of patrons who visited target exhibits to the number of patrons who visited nontarget exhibits. Analysis of data indicated that there was virtually no difference in the ratio of patrons who visited the three target exhibits relative to two nontarget exhibits, see Table 3.
Table 3

Ratio of Participants That Viewed Target Exhibits Relative to Nontarget Exhibits

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean # of visitors to target exhibits</th>
<th>Mean # of visitors to nontarget exhibits</th>
<th>Raw numbers ratio</th>
<th>Reduced ratio</th>
<th>Percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>53</td>
<td>26</td>
<td>53:26</td>
<td>2.0:1</td>
<td>-5</td>
</tr>
<tr>
<td>Treatment</td>
<td>42</td>
<td>22</td>
<td>42:23</td>
<td>1.9:1</td>
<td>-5</td>
</tr>
</tbody>
</table>

On average, under the control condition each of the three target exhibits captured 53 patrons, whereas each of the two nontarget exhibits captured 26 patrons. Thus, the capture ratio of the target exhibits relative to the nontarget exhibits under the control condition was 2:1. On average, under the treatment condition each of the three target exhibits captured 42 patrons, whereas the two nontarget exhibits captured 23 patrons. Thus, the capture ratio of the target exhibits relative to the nontarget exhibits under the treatment condition was 1.9:1. The observed nominal decrease in ratio of visitors to the target exhibits under the treatment condition is inconsistent with the viewership hypothesis that predicted there would be an appreciable increase in visitors to the target exhibits under the treatment condition.

Analysis of Changes in Knowledge Retention

This section presents data from the current study relating to possible effects of supplemental labels on patron knowledge retention. Three hierarchically ordered classes of items were investigated. Class A items measured retention of information that was directly referenced by the supplemental labels. Class B items measured retention of information presented at the end of target extant labels. And, Class C items measured
retention of information presented in nontarget extant labels. Data for these dependent measures were collected via postvisit questionnaires (see Appendix A).

**Knowledge Dependent Measure #1 (Class A Items)**

The average percent correct across the six Class A items were expected to significantly increase when supplemental labels were in place. However, as shown in Table 4, the independent samples *t*-test result for the Class A items indicate that there was not a statistically significant difference (*t* = -.990, *p* = .324, *Δ* = .15) between percent correct under the treatment condition (*M* = .62, *SD* = .25) relative to under the control condition (*M* = .58, *SD* = .26).

Findings from the analysis of Class A item responses do not support the Question-Answer Hypothesis. Supplemental labels apparently had no effect on retention of information directly referenced by supplemental labels. Analyses of the other knowledge-related dependent measures were contingent on finding statistical significance between mean group scores on Class A items. Thus, if subsequent analyses of responses to Class B items and/or Class C items find statistical significance, then those findings should be regarded with suspicion. If subsequent analyses of responses to Class B and/or Class C items do not find significance, then those findings would further indicate that supplemental labels failed to affect reading behavior.

**Knowledge Dependent Measure #2 (Class B items)**

The averaged percent correct across the six Class B items were expected to increase when supplemental labels were in place, though less so than Class A items. The
Table 4

Descriptive Statistics and Independent Samples t-Test Results for Knowledge Dependent Measure #1

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Δ</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>69</td>
<td>.58</td>
<td>.26</td>
<td>- .990</td>
<td>123</td>
<td>.324</td>
<td>.15</td>
<td>7</td>
</tr>
<tr>
<td>Treatment</td>
<td>56</td>
<td>.62</td>
<td>.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

independent samples t test for Class B item responses \((t = -1.463, p = .146, \Delta = .28)\) indicated that participants in the Treatment group \((M = .35, SD = .25)\) performed no better than those in the Control group \((M = .42, SD = .27)\), see Table 5.

These findings are not consistent with the target label hypothesis that predicted supplemental labels would positively affect retention of information presented at the end of target extant labels.

Knowledge Dependent Measure #3 (Class C items)

Class C items measured retention of information contained in extant labels that were not referenced by the supplemental labels. Four of the nontarget labels were located in nontarget exhibits and three of the nontarget labels were located in target exhibits.

Table 6 presents results of an independent samples t test comparing average group responses to Class C items. There was not a statistically significant difference \((t = - .704, p = .482, \Delta = .13)\) between average percent correct by the control group \((M = .50, SD = .31)\) and the treatment group \((M = .54, SD = .33)\).

These findings are not consistent with the halo effect hypotheses, which predicted that the supplemental labels would positively affect retention of information contained in
Table 5

*Descriptive Statistics and Independent Samples t-Test Results for Knowledge Dependent Measure #2*

<table>
<thead>
<tr>
<th>Exhibit</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Δ</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined</td>
<td></td>
<td></td>
<td></td>
<td>-1.463</td>
<td>123</td>
<td>.146</td>
<td>.28</td>
<td>20</td>
</tr>
<tr>
<td>Control</td>
<td>69</td>
<td>.35</td>
<td>.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>56</td>
<td>.42</td>
<td>.27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6

*Descriptive Statistics and Independent Samples t-Test Results for Knowledge Dependent Measure #3*

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Δ</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>69</td>
<td>.50</td>
<td>.31</td>
<td>-.704</td>
<td>124</td>
<td>.482</td>
<td>.13</td>
<td>7</td>
</tr>
<tr>
<td>Treatment</td>
<td>57</td>
<td>.54</td>
<td>.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

even nontarget labels. Findings from Class C items analysis, however, are consistent with findings from the other two knowledge-related dependent measures in failing to find any significant differences in retention that could be attributed to the supplemental labels.

Analysis of Changes in Attitude

The following section presents data from the current study relating to possible effects of supplemental labels on patron attitudes about the museum and the exhibit labels. First, overall levels of satisfaction regarding the museum experience were assessed. Next, levels of satisfaction regarding museum labels in general and supplemental labels in particular were assessed. Where appropriate, group means were
compared using independent samples t tests, and treatment effects were converted to
standardized mean difference effect sizes and percentage point gains/losses. Data for the
dependent measures of attitude were collected via the same postvisit questionnaires used
to collect number of patrons data and knowledge-related data (see Appendix A).

*Attitude Dependent Measure #1 (Museum)*

Three items on the postvisit questionnaire asked patrons to rate their museum
experience on a scale from 1 to 10. Differences in attitude under control and treatment
conditions were compared using independent samples t tests. The result of the pooled t
test indicated that there was not a statistically significant difference ($t = -.248, p = .804,$
$\Delta = .03$) between responses from patrons in the control group ($M = 7.62, SD = 1.80$) and
the treatment group ($M = 7.62, 1.68$), see Table 7. Findings from the analysis of patron
reactions to the museum indicate that the presence of supplemental labels had no effect
one way or the other on patron attitudes about the museum experience.

*Attitude Dependent Measure #2 (Exhibit Labels)*

Attitudes about the exhibit labels under control and treatment conditions were
assessed by an independent samples t test of group differences on the two exhibit labels

Table 7

*Descriptive Statistics and Independent Samples t-Test Results for Museum Satisfaction*

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$</th>
<th>$df$</th>
<th>$p$</th>
<th>$\Delta$</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>66</td>
<td>7.62</td>
<td>1.80</td>
<td></td>
<td></td>
<td>.804</td>
<td>.03</td>
<td>1</td>
</tr>
<tr>
<td>Treatment</td>
<td>56</td>
<td>7.67</td>
<td>1.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
items. The result of the \( t \) test indicated that there was not a statistically significant difference \( (t = 1.049, p = .295, \Delta = -.13) \) between responses from patrons in the control group \( (M = 7.82, SD = 1.80) \) and the treatment group \( (M = 7.58, SD = 1.73) \), see Table 8. These findings indicate that the presence of supplemental labels had no effect on patron attitudes towards exhibit labels—which suggests that patrons either did not notice them or reacted indifferently to them.

**Supplemental Labels**

In addition to collecting data about exhibit labels in general, data were collected about attitudes towards the supplemental labels specifically. Comparative analysis of supplemental label data was not possible due to subjects in the control condition not seeing the supplemental labels. Thus, only participants in the treatment group were asked about the supplemental labels. As shown in Table 9, most (80%) of the participants responded that they remembered seeing the “the yellow oval labels attached to the front of some of the exhibits.” On average, those who remembered seeing any of the six supplemental labels indicated that they had noticed less than half of them \( (M = 2.8, SD = 1.9) \) and read even fewer \( (M = 2.2, SD = 1.9) \).

Table 8

**Descriptive Statistics and Independent Samples t-Test Results for Labels Satisfaction**

<table>
<thead>
<tr>
<th>Condition</th>
<th>( n )</th>
<th>( M )</th>
<th>( SD )</th>
<th>( t )</th>
<th>( df )</th>
<th>( p )</th>
<th>( \Delta )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>66</td>
<td>7.82</td>
<td>1.80</td>
<td>1.049</td>
<td>239</td>
<td>.295</td>
<td>-.13</td>
<td>-3</td>
</tr>
<tr>
<td>Treatment</td>
<td>55</td>
<td>7.58</td>
<td>1.73</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 9

Descriptive Statistics for Supplemental Labels Satisfaction

<table>
<thead>
<tr>
<th>Item</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplemental labels item 1 (% that saw)</td>
<td>54</td>
<td>.80</td>
<td>.40</td>
</tr>
<tr>
<td>Supplemental labels item 2 (# that noticed)</td>
<td>45</td>
<td>2.76</td>
<td>1.93</td>
</tr>
<tr>
<td>Supplemental labels item 3 (# that read)</td>
<td>48</td>
<td>2.24</td>
<td>1.88</td>
</tr>
</tbody>
</table>

The last item on the postvisit questionnaire relating to the supplemental labels was an open-ended item that asked patrons to “Please tell us what you think about the yellow oval labels, why you did or didn’t read them, their helpfulness, etc.” Of the 57 patrons who participated under the treatment condition, 39 responded to the open-ended item (see Appendix D for all comments). In the tradition of qualitative research described by Creswell (1998), data analysis began by reading through all comments to get a sense of common themes. In the initial open-coding phase, brief annotations were jotted down next to the participant comments. Axel coding was then initiated whereby categories of similarly themed comments were grouped together. The final data groupings evolved through a series of combining narrow categories into broader categories. The comments sorting process eventually produced three broad categories under which all participant comments were classified (see Table 10).

The first category of patron responses to the open-ended question could be described as achieved intended outcomes. Of the 39 total comments, almost half \((n = 17)\) specifically mentioned the intended outcomes of the supplemental labels. None of these comments mentioned anything negative regarding the supplemental labels or qualified their use. Some of the comments only mentioned part of the intended outcomes, such as
Table 10

*Patron Comments about Supplemental Labels*

<table>
<thead>
<tr>
<th>Comment category</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achieved Intended Outcomes</td>
<td>17</td>
</tr>
<tr>
<td>Partially Achieved Intended Outcomes</td>
<td>14</td>
</tr>
<tr>
<td>Failed to Achieve Intended Outcomes</td>
<td>8</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>39</td>
</tr>
</tbody>
</table>

"Attention-getting" or "They sure do stick out." Other comments indicated that the supplemental labels fully achieved their intended outcomes. For instance, some of the comments included "They were good because I would want to know the answer after reading them," "I really liked the yellow labels. They made me take a closer look at the artifact and information because they posed a question making me want to know the answer to that question," and "They were good and easily readable. You needed them for the boring basket exhibit."

Unlike comments in the *achieved intended outcomes* category, comments in the *partial success in achieving intended outcomes* category (*n* = 14) all qualify the effectiveness of the supplemental labels. Some of the comments in this category made reference to supplemental labels capturing attention but failing to redirect attention to extant labels, such as "They were yellow and caught my eye, but I don’t understand their purpose" and "I didn’t pay much attention to them." Clearly these individuals noticed the supplemental labels but were not engaged by them. Yet other comments convey the opposite reaction, "I didn’t notice them at first—I looked right pass [sic] them—but the questions they asked were interesting—caught my attention once I saw them." This and
similar comments indicate that the supplemental labels successfully tapped internal motivations but perhaps were not visually salient enough. Still other comments describe supplemental labels as being too salient, “They were ok except they occasionally got in the way of seeing an item or text label in the exhibit,” and “They were in the way of what I was reading. Made me read more.”

The third and final comments category could best be described as failed to achieve intended outcomes. There were the fewest number of comments in this category (n = 8), all of which indicated that the supplemental labels failed to have any affect. Comments like “I can’t remember,” “I’m sorry, but I didn’t see any,” and “I plan on reading the labels on my next visit,” leave little doubt that the supplemental labels failed to achieve their objectives. Lack of attentiveness by patrons could have been influenced by other extraneous factors, as suggested by comments like “I was talking to a friend and was a little distracted” and “I was sort of in a hurry so I didn’t really read anything.”

Subgroup Effects

Although not part of the seven research hypotheses, potentially confounding influences from subgroup membership was investigated using a series of exploratory independent samples t tests. Participant demographic data were obtained via video observations for gender; and via questionnaires for gender, year-in-college, ethnicity, college major, and if participant had previously visited the museum. Influence from year-in-college, ethnicity, and college major were not analyzed due to insufficient subgroup sample sizes resulting in very low statistical power and high probability of committing a Type II error (β > .20).
Exploratory analysis of influence from subgroup membership on behavior, knowledge retention, and attitudes generally did not tend to covary by gender or first-time visitor status. Subgroup analysis of observational data found that amount of time spent at target exhibits (Behavior Dependent Measure #1) did not significantly differ by gender. Subgroup analysis of questionnaire data found that the number of visitors to the target exhibits (Behavior Dependent Measure #2), knowledge retention (Knowledge Retention Dependent Measures #1, #2, and #3), and attitudes (Attitudes Dependent Measures #1 and #2) in most cases did not differ significantly by gender or first-time visitor status. Across all 13 exploratory subgroup analyses performed, the null hypothesis was rejected (with alpha set at .05 for each analysis) only once—for one of the knowledge-related dependent measures. However, after controlling for family-wise Type I error across the three knowledge-related dependent measures using the Bonferroni correction (Bonferroni, 1935) or Sidak correction (Sidak, 1967), statistical analysis failed to achieve significance.
The present research was motivated by a desire to develop a cost-effective means of improving the educational effectiveness of targeted labels in museum exhibits. One possible means of doing so hinted at in museum studies literature was to add new supplemental labels to museum exhibits. The theoretic framework for the present study was based on selective attention and related research drawn from cognitive psychology literature. The intent of the supplemental labels was twofold: (a) attract attention, and (b) redirect attention to target extant exhibit labels.

Seven specific hypotheses guided the present study—this chapter is organized around these hypotheses. Two of the hypotheses addressed the effects of supplemental labels on patron behavior. Three of the hypotheses addressed the effects of supplemental labels on patron knowledge retention. The last two hypotheses addressed the effects of supplemental labels on patron attitudes. This chapter concludes with a discussion of additional factors that might have influenced the research findings, limitations of the present research, and possible directions for future research.

Behavior Hypotheses

It was hypothesized that under the treatment condition (supplemental labels in place), museum visitors would be apt to visit target exhibits for longer periods of time and in greater numbers. To quantifiably assess behavioral changes, patrons were videotaped and administered a postvisit questionnaire. Time-stamped video recordings were
used to ascertain the amount of time each patron spent at the target exhibits. Responses to specific items on the postvisit questionnaire were used to determine the number of patrons who visited the three target exhibits (exhibits to which supplemental labels were applied under the treatment condition) and two nontarget exhibits (exhibits that at no time during the study had supplemental labels).

Engagement Hypothesis

The average time patrons spent viewing the three target exhibits was expected to increase under the treatment condition relative to under the control condition. However, findings from video observations indicated that supplemental labels had no effect on patron behavioral patterns. The amount of time patrons spent at each of the three target exhibits did not significantly vary between control and treatment conditions. The average effect size across all three target exhibits was only one fifth of a standard deviation and was not statistically significant. The negligible impact of supplemental labels on amount of time patrons spent viewing the target exhibits was unexpected, if not startling—given the spectacular increase in time scores found by Hirschi and Screven (1988) in their research on supplemental labels. Whereas Hirschi and Screven found a 1,400% increase in average time spent viewing exhibits when supplemental labels were in place, findings from the present study found only a 24% increase.

The difference in outcomes between the present study and the Hirschi and Screven (1988) study is not easily reconciled. Perhaps the different modes of data collection produced different results. In the present study, time scores were obtained by coding video footage from security cameras. In the Hirschi and Screven study, time
scores were obtained by directly observing patrons in the museum. It is possible that the presence of the researcher could have biased viewing behavior in the Hirschi and Screven study. Or, perhaps the populations used in the two studies were so different that direct comparison is not possible. Whereas the present research was conducted on undergraduate college students, the Hirschi and Screven research was conducted on family groups. It might be that supplemental labels are effective on family groups but do not generalize to other populations. Then again, perhaps physical features of the supplemental labels used in the present study (oval shape, yellow background) made them relatively less effective than those used in the Hirschi and Screven study (rectangle shape, white background).

**Viewership Hypothesis**

The ratio of patrons who visited the target exhibits versus nontarget exhibits was expected to increase under the treatment condition relative to under the control condition. Although the supplemental labels used in the present study failed to increase the amount of time patrons spent at target exhibits, it was still theoretically possible that supplemental labels could have influenced the total number of visitors to the target exhibits. The logic behind this premise is that the salient supplemental labels could have captured visual attention and drawn patrons from nearby exhibits that otherwise would not have visited the target exhibits.

Although it was hoped that the questionnaire data would produce a different finding from that of the observational data, in fact, they did not. Again, there was no statistically significant difference between control and treatment conditions regarding
patron behavior. The supplemental labels failed to noticeably increase the number of patrons who visited the target exhibits, relative to nontarget exhibits.

In sum, it appears the effects of supplemental labels on behavior were negligible. There were no statistically significant differences between group means of time spent viewing target exhibits or number of patrons who visited target exhibits, regardless of whether or not supplemental labels were in place. Findings from the present study differ markedly from findings by Hirschi and Screven (1988) in similar research.

Knowledge Retention Hypotheses

It was hypothesized that when supplemental labels were in place, museum patrons would read and remember more information contained in target extant labels. It was further hypothesized that the supplemental labels would not adversely affect readership of nontarget extant labels. In other words, increased readership of target extant labels would not come at the expense of decreased readership of nontarget extant labels. If the knowledge retention hypotheses were supported, they would provide evidence that supplemental labels could be an inexpensive means of increasing the educational effectiveness of select museum exhibits.

Question-Answer Hypothesis

The average retention of information relating to answers posed by the supplemental label questions was expected to increase under the treatment condition relative to under the control condition. This was based on the supposition that patrons who visited the museum when supplemental labels were in place would read and retain
more information contained in target extant labels relative to under the control condition. However, this hypothesis was not sustained during analysis of the data. There were no statistically significant differences between average responses under control and treatment conditions to information referenced by the supplemental label questions.

*Target Label Hypothesis*  
Average retention of information contained in target extant labels that was presented *after* answers to supplemental label questions was expected to increase under the treatment condition relative to under the control condition. This hypothesis predicted that patrons would continue reading target extant labels even after they reached the answers to supplemental label questions. It was found, however, that findings from analysis of the data did not confirm this hypothesis. There was no statistically significant difference between group means on the dependent measure used to test this hypothesis. Failing to confirm this hypothesis provides additional evidence that participants under the treatment condition did not read any portion of target labels more than participants under the control condition.

*Halo Effect Hypothesis*  
Average retention of information contained in *nontarget* extant labels was hypothesized to increase under the treatment condition relative to under the control condition. This hypothesis predicted that patrons would be more likely to read even nontarget labels when supplemental labels were in place. However, just as with the other two knowledge-related hypotheses, data analysis failed to detect any significant difference between group means. This finding further confirms that the supplemental
labels simply had no effect on patron knowledge-retention. Given that the first two knowledge-related hypotheses failed to be confirmed, also failing to confirm this hypothesis could actually be viewed as a favorable finding. Had this hypothesis been confirmed while the other two knowledge-related hypotheses not been confirmed, then this would have suggested that the supplemental labels had a negative effect on patrons by driving them away from target labels and to nontarget labels.

In sum, it appears the effects of supplemental labels on knowledge retention, just as with changes in behavior, were negligible. There were no statistically significant differences for any of the three knowledge-related hypotheses.

Attitude Hypotheses

It was hypothesized that under the treatment condition, participant attitudes would increase or at least remain unchanged relative to the control condition. Attitudes were measured via the same postvisit questionnaire used to collect data on the number of visitors to the exhibits and patron knowledge retention. Responses to the five satisfaction items of the postvisit questionnaire were used to ascertain attitudes about the museum experience in general and exhibit labels specifically.

Museum Satisfaction Hypothesis

Average attitudes about the museum were expected to increase under the treatment condition relative to under the control condition. This hypothesis predicted that the supplemental labels would facilitate a more enjoyable museum experience. However, findings from attitude items on the questionnaire indicated that supplemental labels failed
to influence patron satisfaction levels towards the museum. Similar as to what was found during analyses of behavior and knowledge retention data, there were no significant differences in patron attitudes under the treatment condition relative to under the control condition. Failing to reject the null for the museum satisfaction hypothesis was not at all surprising given the relatively small contribution supplemental labels were likely to have on the overall museum experience. The presence of supplemental labels was much more likely to be detected by the labels satisfaction hypothesis, which specifically addressed attitudes about exhibit labeling.

*Labels Satisfaction Hypothesis*

Average attitudes about exhibit labels used in the museum were expected to increase under the treatment condition relative to under the control condition. Were this hypothesis to be confirmed, irrespective of whether or not the behavior and knowledge-retention hypotheses were confirmed, it would have indicated that patrons felt that the supplemental labels were an asset to the exhibits. However, this hypothesis, like all the other hypotheses of the present research, was not confirmed. At least attitudes about the labels under the treatment condition were not significantly lower than under the control condition, which would have indicated that patrons were annoyed by the supplemental labels.

In sum, attitude data was consistent with behavior and knowledge retention data collected for the present research. There was no statistically significant difference between control and treatment groups on measures of attitude.
Conclusions

In short, findings from the present research suggest that the supplemental labels used in the study failed to have any effect on readership of extant exhibit labels. The triangulation of data from video observations and questionnaire responses converge to suggest that supplemental labels did not significantly impact patron behavior, knowledge-retention, or attitude.

Literature from cognitive psychology and museum studies, which formed the theoretic foundation for the present study, indicated that not only were desired outcomes possible but effect sizes would likely be large. The evidence for probable success of the supplemental labels was so compelling to some members of the dissertation committee for this research that they considered the likelihood of success to be inevitable. Conducting the research was largely viewed as an exercise in confirming self-evident outcomes. However, as was borne out in the findings, conducting research in a naturalistic setting does not always produce anticipated results. In clinical research the researcher is able to tightly control numerous aspects of the experimental condition, such as the participant’s field of vision, levels of concentration, duration of stimuli presentation, and a various other factors. Whereas, in a naturalistic setting the researcher has little- to no control over such extraneous factors that could potentially influence outcomes.

There are several plausible reasons why the supplemental labels failed to accomplish their intended outcomes. Perhaps the supplemental labels simply were not sufficiently visually compelling enough to exogenously capture attention. Jonides and
Yantis (Jonides & Yantis 1988; Yantis & Jonides, 1984) might have been right when they suggested that abrupt onset (e.g., sudden luminance change) is the only purely stimulus-driven property that can produce involuntary shifts of attention. Color and other discontinuities might be effective in capturing attention only when subjects are cued in some way. Findings from the present research suggest that endogenous influences on attentional focus might be difficult to overcome through exogenous means, short of turning the museum into a carnival of flashing lights and jack-in-the-box style pop-ups.

Perhaps motivations driven by personal interests overrode any situational interest that could have been generated by the supplemental labels. Personal or individual interest refers to long-standing preferences on the part of an individual for certain topics or related subject matter (Schiefele, 1992). Situational or transitory interest is typically induced by environmental factors such as task instructions or an engaging text (Schraw, Flowrday, & Lehman, 2001). Museum patrons bring with them inherent interests in particular subjects. Museum patronage is a volunteer leisure-time activity. Museum visitors are not required to read labels, they do so of their own volition driven by content specific interests. It might be relatively challenging for exhibit labels, regardless of how distinctive or innovative they might be, to induce situational interest in a museum environment to the extent that patron behavior is modified.

Comments to the open-ended question on the postvisit questionnaire indicated that other cognitive processes might have also played a role in the ineffectiveness of the supplemental labels. Comments like “I didn't notice them at first—I looked right pass [sic] them—but the questions they asked were interesting—caught my attention once I saw them” indicate that patrons might have experienced inattentional blindness in regard to
the supplemental labels. Inattentional blindness occurs when an individual’s attentional focus is oriented to one set of objects and they fail to notice an unexpected salient object (Simons, 2000). It is possible that participants of the present study had oriented themselves to focus on artifacts and extant labels that were set back into the display cases and were inattentionally blind to the unexpected salient supplemental labels. In which case, the salient characteristics (e.g., size, color, and placement) could have actually worked against the supplemental labels. The supplemental labels might have been pre-attentively interpreted as not truly part of the exhibits and hence gone unnoticed.

Potential Biases and Limitations

The present study attempted to avoid committing obvious methodological mistakes and oversights. That said, no study is completely free from at least some limitations. Findings from the study were anticipated to generalize to other kinds of informal education centers in other locales and other populations; however, it is possible that the research population differed significantly from other museum populations.

Subjects used in the study, undergraduate college students, were typical patrons of the USU Museum of Anthropology and typical of subjects used in many other social science studies. However, the subjects were likely atypical of most museum patrons—this might have contributed to the observed ineffectiveness of the supplemental labels. Also, it is possible that biasing of the results could have occurred due to motivating participation through extrinsic rewards. The iPod drawing and/or course extra credit offered to patrons for their participation were probably powerful reinforcers. Typically, museum patronage is driven by interest and curiosity about the material presented.
without obvious extrinsic reward. Perhaps the supplemental labels as tested would have been successful on another population or on the research sample under different circumstances.

Future Directions

Findings from this research raised many questions. It was anticipated that patron behavior, knowledge retention, and attitudes would all be positively influenced by the supplemental labels. However, in the final analysis, the supplemental labels failed to produce any statistically significant findings. Suggestions for future research on supplemental labels include addressing shortcomings of the present research and the research of Hirschi and Screven (1988). Investigating the influence of inattentional blindness and priming patrons to help generate situational interest are other possible directions for future research.

A future study could employ a one-control and two-treatment groups research design whereby one of the treatment conditions would replicate the present experimental condition and the other treatment condition would replicate the experimental condition proposed by Hirschi and Screven (1988). Experiments should be conducted in a museum that attracts a diverse population; ideally a university museum frequented by both college students and families. Outcomes should include measures of time and knowledge gain.

Another intriguing direction for future research would be to investigate the influence of inattentional blindness in the museum environment. Findings from the present study strongly suggest that the supplemental labels failed to consistently attract attention, despite their salient physical characteristics. Comments like “I never saw
them,” “Did not notice” and “I didn’t notice them” were all too common in the open-ended responses. Not ascertainable from findings of the present study is whether or not inattentional blindness is limited to labels. For instance, would an out-of-context artifact also be overlooked? Further, are patrons more likely to be inattentional blind to supplemental labels that conform to other visual features of an exhibit that are located on the front glass of an exhibit or to salient supplemental labels that are located at the same visual depth as the artifacts and extant labels?

It is possible that inattentional blindness to the supplemental labels could be overcome by endogenously priming patrons as they enter the museum. Supplemental labels as tested might be eminently noticeable and capable of capturing attention if endogenous motivations can be modified to register target exogenous features. If supplemental labels related to each in subject matter, such as highlighting the extant labels that mention anthropology as a profession, and patrons were alerted to the thematic intent and physical characteristics of supplemental labels, then patrons might be induced to seek out the supplemental labels. Some comments from the present study like “I don’t know what they are,” “They were yellow and caught my eye, but I don’t understand their purpose,” and “If I would have known they were questions for the survey and not, as I thought, for a class, I may have been able to answer more questions” indicated that some patrons needed more guidance as to why they should take notice of the supplemental labels. Implemented correctly, the study could be an example of combining the endogenous factor of situational interest in an identified theme with the exogenous factor of a featural singleton.
Regardless of specific research questions and modes of data collections, there are several characteristics that future research on the subject should include. Future research should be developed within a cognitive psychology framework or other existing body of knowledge to help shape parameters of the study and place it within an appropriate context. Quantitative and qualitative research methods employed by the present research both yielded valuable information—a mixed-methods design is highly recommended for future research. Lastly, dependent variables of future research on supplemental labels should be broad and include measures of behavior, knowledge/learning, and attitude/affect.
REFERENCES


APPENDICES
Appendix A:

Questionnaire
Thank you for visiting the Utah State University Museum of Anthropology. Please take a few minutes to fill out the following survey. Data collected from this survey will be used to assess the effectiveness of current exhibits and help inform development of future exhibits. Please mark one answer per item below.

1. Did you visit the Indian Baskets Exhibit?  
   @ yes ➔ answer items 2-6  
   @ no ➔ skip to item 7

2. The purse-shaped basket used in the Jump Dance contains  
   @ wooden figurines and other small totems  
   @ bones of ancestors  
   @ shredded bark  
   @ salmon bones

3. The Jump Dance is still performed every  
   @ year  
   @ other year  
   @ third year  
   @ fifth year

4. The Monache Gathering Basket was primarily used to gather  
   @ acorns, berries, and large seeds  
   @ peyote and other ceremonial plants  
   @ salmon bones  
   @ small sticks and pine needles for fire kindling  
   @ dead grasshoppers that had washed ashore

5. The conifer root on the body of the Hupa Cooking Basket  
   @ is flexible when dry and rigid when wet  
   @ is permeable, thus liquid must be added while cooking  
   @ provides rigidity even under high heat  
   @ swells when moist making the basket watertight

6. The Monache Stirring Stick for the Hupa Cooking Basket is held together with  
   @ cotton string  
   @ pounded ash splints  
   @ braided sweetgrass  
   @ spring willow

7. Did you visit the Maria Martinez Exhibit?  
   @ yes ➔ answer items 8 & 9  
   @ no ➔ skip to item 10

8. Maria Martinez was a member of the  
   @ anthropology team that discovered Tenochtitlan (Aztec capital)  
   @ Perpecha Indian tribe in Arizona  
   @ Ildefonso Pueblo in New Mexico  
   @ Mexican arts and crafts movement

9. Maria Martinez was most famous for  
   @ black on black pottery  
   @ writings about Aztec society  
   @ photos & small baskets  
   @ studying Aztec art

10. Did you visit Otzi the Iceman Exhibit?  
    @ yes ➔ answer items 11-15  
    @ no ➔ skip to item 16

11. The lines on Otzi’s teeth indicate that his growth stopped temporarily  
    @ due to a severely cold and prolonged winter  
    @ as a result of a pituitary disease  
    @ due to illness or food shortages  
    @ as a result of a severe blow to the head

12. When the Iceman was alive he suffered from “whipworm” which is  
    @ an epidemic parasite that causes tooth loss  
    @ an intestinal parasite that causes diarrhea  
    @ a Chicken Pox-like virus that left red skin lesions

13. Scientists estimate the Iceman’s age to be around  
    @ 21 years old  
    @ 23 years old  
    @ 46 years old  
    @ 55 years old

14. During an examination of the Iceman’s body in 2001 scientists discovered  
    @ rope burns on his wrists  
    @ a contusion at the base of his skull  
    @ a knife wound under his arm  
    @ an arrow point in his shoulder

15. Initially scientists believed the Iceman died due to exposure to the cold; they now believe he  
    @ perished due to injuries sustained during a fall  
    @ died due to pneumothorax (collapsed lung)  
    @ bled to death  
    @ succumbed to pneumonia

(please turn page over)
16. Did you visit the Dogon Sculpture Exhibit?  
   ① yes → answer items 17 & 18  
   ② no → skip to item 19

17. The Kanaga Mask was used in the dancing ritual "dama" to  
   ① pay tribute to Mali—the god of the underworld  
   ② give recognition to fallen Dogon warriors  
   ③ keep the dead souls from endangering the living  
   ④ pay tribute to Nommo—the god of rain and fertility

18. The Kanaga Mask was worn to  
   ① protect the dancer  
   ② limit the dancer’s mobility  
   ③ make the dancer appear taller or more powerful  
   ④ enhance the dancer’s sight and hearing

19. Did you visit the Ancient Egypt Exhibit?  
   ① yes → answer items 20-24  
   ② no → skip to item 25

20. Anubis was the opener of roads for the dead and was often shown as  
   ① a cat or cat-like person  
   ② a raven-headed man holding a scythe  
   ③ a jackal or a man with a jackal’s head  
   ④ either a man or a woman

21. Osiris, the god of the underworld and of vegetation, was often depicted  
   ① in a rainbow cloak  
   ② in human form wrapped up as a mummy  
   ③ as a Nile crocodile or amphibious serpent  
   ④ as a tree with “never ending” roots

22. During the New Kingdom of ancient Egypt, tombs for royals changed from large pyramids to  
   ① burial mounds called gizas  
   ② grand crypts built into royal palaces  
   ③ tombs cut deep into cliffs  
   ④ mountain top labyrinths called ziggurats

23. The purpose of a Ka-Statue was to  
   ① pay tribute to a reigning pharaoh  
   ② protect someone from Cetus during the afterlife  
   ③ hold the spirit of a person if the mummy was desecrated  
   ④ pay tribute to all previous pharaohs

24. A Ka-Statue of Pharaoh Aubire Hor bears on his head  
   ① a serpent holding an Ankh  
   ② the outstretched arms of the Ka sign  
   ③ a pyramid-shaped crown made of gold and onyx  
   ④ symbols of the three elements (fire, earth, water)

Please rate the degree to which you agree with the following statements regarding the USU Museum of Anthropology  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. I enjoyed visiting the Museum</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
<tr>
<td>26. I definitely plan to visit the Museum again</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
<tr>
<td>27. I will recommend visiting the Museum to others</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
</tbody>
</table>

The following items relate to the exhibit text labels  

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Overall, the exhibit labels were helpful</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
<tr>
<td>29. Overall, the exhibit labels were enjoyable to read</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
<tr>
<td>30. Did you see the yellow oval labels attached to the front glass of some of the exhibits?</td>
<td>⑥ yes</td>
<td>⑨ no</td>
<td></td>
</tr>
<tr>
<td>31. How many yellow oval labels did you notice?</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
<tr>
<td>32. How many yellow oval labels did you read?</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
<tr>
<td>33. Please tell us what you think about the yellow oval labels, why you did or didn’t read them, their helpfulness, etc.</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
</tbody>
</table>

Please fill out the following items as they relate to you

34. Was this your first visit to the USU Museum of Anthropology?  
   ③ yes  ⑥ no
35. Year in school:  
   ④ freshman  ⑦ sophomore  ⑩ junior  ⑬ senior  ⑱ graduate student  ⑳ other
36. Ethnicity:  
   ⑤ African American  ⑪ Asian  ⑮ Caucasian/white  ⑰ Hispanic  ⑳ mixed/other
37. Sex:  
   ④ female  ⑦ male
38. College major
Appendix B:

Recruitment Flier
Visit the USU Museum of Anthropology during the special Open House Week of September 25-29, 2006 and enter to win a 30GB Video iPod. Plan to spend 15-20 minutes visiting the Museum, after which you will be asked to fill out a short survey and be entered in the iPod give-away.
Appendix C:

Supplemental Labels
What do you think the purse-shaped Jump Dance basket contains?

Do you know why conifer root was used to make this basket?

What do lines on the Iceman’s teeth indicate?
Who was Anubis and what was he often shown as?

Do you know what the purpose of a Ka-Statue was?

What was found during a recent examination of the Iceman?
Appendix D:

Open-Ended Item Comments
**Patron Comments – Successfully Met Objectives**

In reading the yellow oval I came across it inspired me to read further the information within the case.

Attention-getting.
Really intrigued me to read the descriptions within.
They were yellow so they caught my attention, I like little facts.
They were good because I would want to know the answer after reading them.
Enjoyed answering questions some hard to find the answer.
They make you think about it, which is good
They were awesome and lead me to pay closer attention to that which was written.
They were good and easily readable. You needed them for the boring basket exhibit.
I thought they were helpful in explaining the exhibits.
They made me want to read to learn the answer to the proposed question.
It helped, I looked for the answer to the question.
They sure do stick out.
I thought they were interesting and helpful.
They did get me to stop and think about the question
I really liked the yellow labels. They made me take a closer look at the artifact and information because they posed a question making me want to know the answer to that question.
The labels ask you a question about a pertaining item and you guess what's inside and what it was used for.

**Patron Comments – Partially Successful/Qualified Success in Meeting Objectives**

They were interesting, but nothing really entertaining.
I didn't pay much attention to them.
They were kind of pointless because I would've read the answer anyway. Questions on them were more for kids.
I was in a hurry, so I didn't read everything, but when I did read them, they got me interested.
I don't know what they are.
Well, some of the questions I found answers to
They were ok except that they occasionally got in the way of seeing an item or text label in the exhibit.
I didn't notice them at first -- I looked right pass them -- but the questions they asked were interesting -- caught my attention once I saw them.
I found them to be good questions, I just had a hard time finding which label to find answers.
If I would have known they were questions for the survey and not, as I thought, for a class, I may have been able to answer more questions.
They were in the way of what I was reading. Made me read more.
The ones I read were helpful. I didn't notice very many of them.
They were yellow and caught my eye, but I don't understand their purpose.
The labels provoked thought, but I only looked for a few answers. I actually wondered why they weren't longer and in all of the exhibits.
Patron Comments – Failed to Meet Objectives

I never saw them.
I can't remember
I'm sorry, but I didn't see any.
I was talking to a friend and was a little distracted.
I was sort of in a hurry so I didn't really read anything. I plan on reading the labels on my next visit.
Did not notice.
I get impatient.
I didn't notice them.
VITA

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