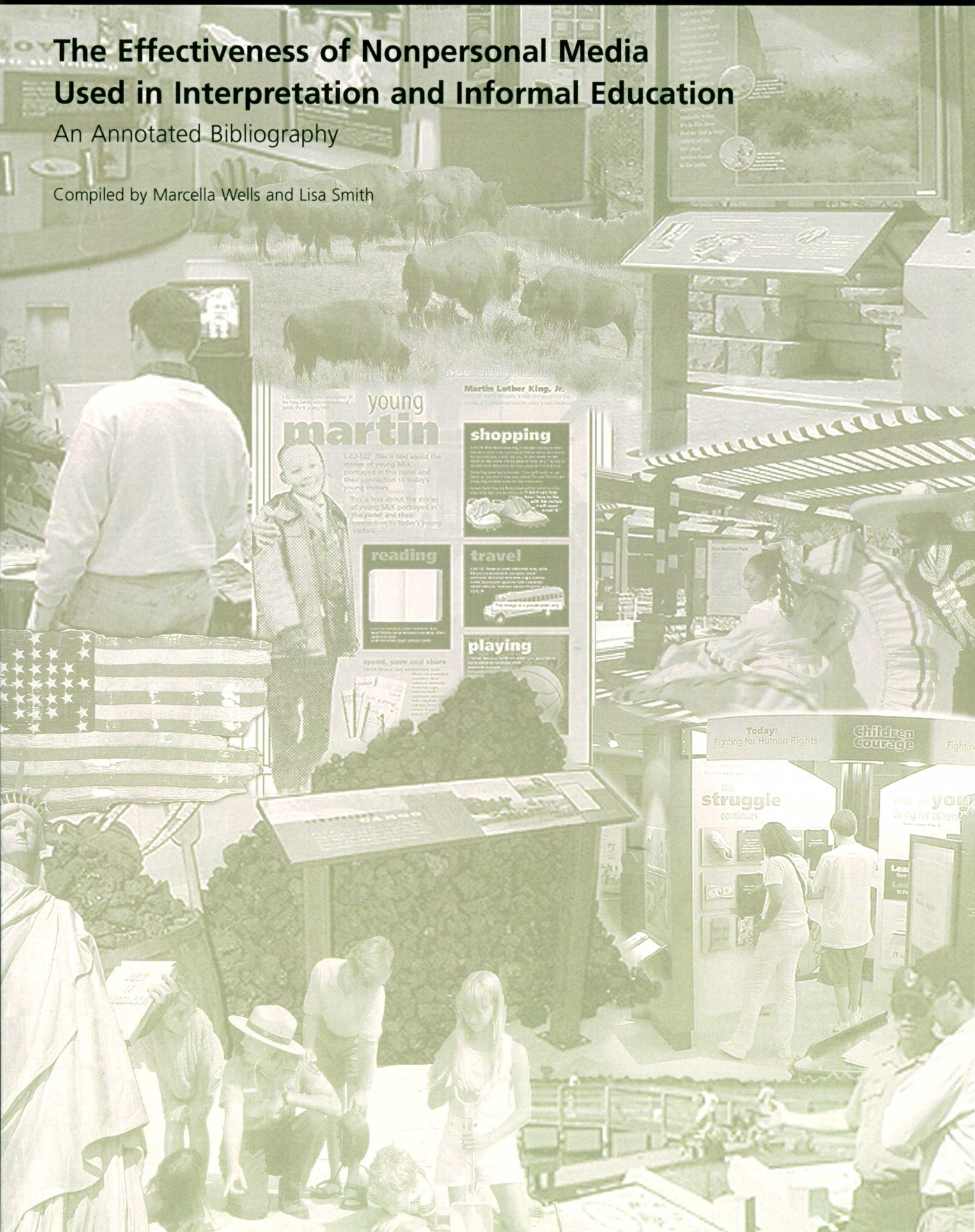




The Effectiveness of Nonpersonal Media Used in Interpretation and Informal Education

An Annotated Bibliography

Compiled by Marcella Wells and Lisa Smith



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Introduction

The purpose of this bibliography is to present a review of the existing research and useful literature related to the effectiveness of nonpersonal interpretive media. For this document, nonpersonal media include exhibits, signs and labels, printed material such as brochures and interpretive publications, audiovisual media, and computer and technological education.

The following databases and document sources were consulted in order to compile this bibliography:

- CAB Abstracts
- WorldCat
- Web of Science
- SPORTDiscus
- PsycInfo
- ERIC
- NTIS
- Dissertation Abstracts
- PapersFirst
- Article First
- mlc.lrdc.pitt.edu/mic
- Screven, C.G., Ed. 1999. *Visitor Studies Bibliography and Abstracts, 4th ed.*
- Wells, M., Adams, A., and Wright, B. 1995. *Evaluating Interpretation: An Annotated Bibliography.*
- Lee, C., Ed. 1998. *Bibliography of Interpretive Resources.*
- Wright, B., and Wells, M. 1990. *A Field Guide for Evaluating National Park Service Interpretation.*
- Visitor Studies: Theory, Research, and Practice (Volume 1-8).
- Visitor Studies: Conference Abstracts (1999).

The following keywords were used to search these sources:

- brochure
- visitor
- national park
- interpretation, interpretive, interpret
- effective, effectiveness, effect
- evaluation
- visitor studies
- park interpretation
- publication
- discovery box
- kiosk

- sign
- self-guided
- audio, audiotape
- slides, slideshow
- visitor center, museum, nature center
- trail
- wayside
- exhibit, display
- video
- program
- interactive
- computer, website, technology, Internet
- orientation, wayfinding, advanced organizers

All sources judged relevant to the topic of the bibliography were reviewed, summarized, and organized as described below. The organization of the bibliography is described below, followed by a brief executive summary describing some of the major findings from this body of research. In the executive summary, several citations are provided parenthetically to major ideas presented. These citations contain the primary authors' last names only, with an indication of the citation to which they refer as appropriate (e.g., a = first time that author is mentioned as primary author in the bibliography, b = second time that author is mentioned as primary author in the bibliography, etc.).

Organization of the Bibliography

Sources are organized alphabetically by primary author's last name. Each citation includes (a) the full study citation, (b) the study purpose or research question(s), (c) the primary data collection tool or method, (d) a brief description of the sample, (e) the major variables of interest in the study, (f) important findings, and (g) significant keywords. The keyword section indicates (a) the type of media studied and (b) the variables examined in the study. Media keywords were limited to the following in order to maintain some consistency across sources:

- sign
- audio/visual

possible the same media type and variable keywords used to describe the research studies are used to describe these reference works.

Executive Summary

This bibliography describes over 300 sources which recount research and empirical study of nonpersonal education and interpretive media. A great deal of the research reported was conducted in museums. However, a number of studies were conducted in nature centers, at trailheads, or in other informal learning or natural resource recreation settings. Although the samples for most studies were visitors at large, a number of studies were conducted with specific audiences, such as school-age children, families, computer users, and so forth.

A variety of research designs and data collection methods were employed. Surveys, observation, and interviewing were used most often, but some studies discuss the use of focus groups, quizboard testing, or photography as a means for collecting data. Several studies employed a pre- and posttest design for measuring variables of interest, but more employed only a posttest. Often the form of experimental or quasi-experimental design was unclear.

Some of the most compelling findings are as follows. For example, a number of studies conclude that interactive, active, hands-on, and multimedia exhibits are more effective than noninteractive or passive forms of media for increasing participation time, learning behaviors, and information processing [e.g., Ayers, Borun (b, e), Eason, Derwin, Koran (a), Wright, Hayward, Morgan, Sariscsany, Liu, Ottinger]. Even intellectually interactive media, such as the use of questions in labels, appears to stimulate learning (e.g., Hirshi, Arndt, Litwak, Leonard, Greenglass, Farragher), though one study questions the effectiveness of higher level questions used to facilitate learning (Andre).

Large, dramatic exhibits seem to hold visitors' attention for greater periods of time and have more cognitive potential (e.g., Cone, Johnston) as do naturalistic or realistic, and 3-

- publication
- exhibit/display
- facilities
- program
- computer
- orientation/wayfinding
- museums
- graphics
- labels

Study variable keywords include the following:

- affect
- attention
- attitude
- attraction
- awareness
- behavior
- beliefs
- comprehension
- knowledge
- learning
- legibility
- perception
- preference
- recall
- recognition
- retention
- satisfaction
- time
- use

A quick reference chart at the end of the annotated citation section summarizes many of the major studies by media type and study variable.

Sources which were not specifically research studies or which did not include data collection and conclusions are included at the end of the bibliography in a reference section. These sources are also organized in alphabetical order by author's last name. The reference citations are organized into one of two categories: (a) theory/think piece — a reference, book, or manuscript which proposes a new idea or suggests a conceptual framework for future empirical study; and (b) study review/metanalysis — a review of more than one study which synthesizes a body of research or writing related to a common theme. As much as

D exhibits (Kool, Borun (d), Johnston, Pearl). Visitors also seem to prefer dynamic, animated exhibits over static exhibits [McManus (c), Washburne (a, b)] although it is unclear how long learning from these types of exhibits might last [McManus (c), Shettel (a)]. Some static exhibits, however, are shown to be educationally effective (DeMouthe).

There seems to be a direct positive correlation between time spent with exhibits and increased interest in and increased learning from interpretive media [Saunders, DeMouthe, Barnard (a), Birney (a), Cole (b), Cone]; however, recall and learning seems to decline as the number of exhibits and/or the number of items in a display increases [Barnard (a, b)].

Complex displays and displays with statistical data, graphs, and tables are less effective in terms of holding visitor attention (e.g., Derryberry) than are simple drawings [Serrel (c)], simple, nonscientific appeals [Cole (a), Cardinal], and simple approaches and layout (Nathan, Roggenbuck). This is also true for interpretive narrative. In fact, several studies support the use of specific, concrete language and relevant examples to improve effectiveness (Young, Korn, Anderson).

Whereas studies indicate that visitors prefer unstructured or less structured tours and exhibits [Falk (a), Stronck], studies also indicate that visitors appreciate lectures and lecture tours (Robinson, Nedzel, Laurie), and that teacher- or guide-facilitated groups experience enhanced learning (VanRennes, Jacobson, Roggenbuck, Gutierrez, de White, Jones, Flexor, Stronck).

Prior interest affects visitors' attraction to an exhibit [Alt (a)]. Preparatory, previsit materials, or preorganizer information affect visitor attention to and involvement with interpretive media [Goldberg, Koran (b), Bloombert, Grotelueschen, Grennaro]. Furthermore, color and font effect interpretive processing. Whereas some visitors may be attracted to brightly colored labels (Bryant), high contrast in signs and labels seems to be more effective than merely bright colors [Serrell (c), Cole (b)], but color used in exhibits is reported to be better than black and white [Parsons (a)]. Type size may also affect processing. Although no differences were detected in attracting or holding power attributed

to type size, reading increased as type size increased [Thompson (b)]. Although results are inconclusive, other studies have examined typefaces and type size for legibility and readability (Evans, Harvey, Serrel).

Sensory processing, especially auditory processing of interpretive media, has received a great deal of research attention. Interpretation with audio features improves retention [Screven (a), Wagar, Beck, Ogden], increases knowledge [Pearl, Reis, Screven (b, c), Barnard)]especially for first-time visitors (Feldman), and is often preferred to other forms of interpretive media [Mahaffey, Wagar (b), Blake, Light]. There is some evidence to suggest that learning may be enhanced when audio is combined with visual stimulation such as video or slides (Crigler, Morrissey).

Research on the effectiveness of computers in informal learning is still inconclusive, though studies indicate that computers increase both attracting and holding time (Hike, Searles) and may potentially enhance learning [VanRennes (b), Huffman (b), Hultsman]. A great deal of work is needed regarding the effect of computers and visitor use of the Internet and the World Wide Web as it relates to informal and lifelong learning.

Annotated Research Articles Related to the Effectiveness of Nonpersonal Media Used in Interpretation and Informal Education

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Abler, T S	Traffic patterns and exhibit design: A study of learning in the museum. In: S. de Borhegyi, & I. Hanson (Eds.), 1988. The Museum Visitor. Publications in Museology: No. 3 (pp.103-41).	An experimental study of the effects of (1) preferred vs. nonpreferred direction of approach (right or left) to a basket weaving exhibit, and (2) the order of presentation (forward or reverse) of objects (baskets) on time spent at exhibit.	post-visit questionnaire	museum visitors	learning; approach direction; exhibit order; time spent	Both time and learning scores were higher for visitors approaching exhibit from the left (nonpreferred direction) regardless of order of presentation of exhibit objects. The more time spent, the more learning occurred. Focus groups identified the perceived benefits and expectations of typical visitors about the museum that could influence their decisions to visit museums. Evaluating the positive or negative impact on the public of on-site messages enables museums to develop or improve programs and collections that encourage positive impact and decrease negative impact.	Exhibit/Display: knowledge, preference, time
Adams, G D	Understanding and influencing word-of-mouth. In S. Bigood, J T Robert, Jr, & A Benefield (Eds.), 1988, Volume 1, Visitor studies: Theory, research, and practice. (pp. 51-59)	Examination of the influence of word-of-mouth activities that typically follow museum visits. The effects of three kinds of messages (pre-visit messages, on-site messages, and post-visit messages) were presented.	focus group discussions	visitors	impressions		Signs, Labels, preferences
Allard, M. Boucher, S	Le Musée et l'école [The museum and the school]. 1991 Montréal, Québec, Canada: Éditions Hurtubise HMH, Ltd. 139 pp.	The results of a 10-year study by the Research Group on Education and Museums ("Group de Recherche sur l'éducation et les Musées") examining potential linkages between formal education domain of schools with informal domains that take place during school visits to museums or can later facilitate educational activities in schools.	before and after museum visits	museum visitors	cognitive skills; aesthetic responses; affective outcomes	Effects on educational performance and behavior. Museums are examined in terms of their unique contributions to the educational process--their motivational role, participatory activities, questioning, and so on.	Facilities; knowledge, preference
Allen, S	Using scientific inquiry activities in exhibit explanations. Science & Education, 81(6), Nov 1997, 715-734.	Investigated the effect of different scientific inquiry activities (1) generate an explanation; 2) interpret an explanation; 3) troubleshoot an explanation; 4) choose between two explanations; 5) choose plus design a discriminating experiment; 6) choose plus make and test a related prediction; 7) make a prediction before experiencing the phenomenon on visitors' understanding of the science underlying an interactive exhibit, "colored shadows." Colored shadows refer to a pattern on a white wall resulting from a person's body blocking the light from colored lamps.	post-test	392 museum visitors, aged 7 to adult	comprehension	The results showed that the interpretation activity was the most effective in facilitating visitors' understanding of the mechanism of shadow-creation; least effective was the activity in which visitors made a prediction before experiencing the phenomenon.	Exhibit/Display: knowledge
Allison, J C	Analysis of interpretive media and their application to Spence Gulch, Idaho. 1965. Master's Thesis. Utah State University: Logan.	This study tested the effectiveness of interpretive media designed for the interpretation of Spence Gulch trilobite fossil quarry in Idaho. The objectives were to: 1) pretest interpretive techniques and develop a methodology for measuring the effectiveness of interpretive media. 2) to propose guidelines for the interpretive development of Spence Gulch fossil beds as a recreation collection area.	recall test: intra-media comparison test; quizboard	488 junior high students	recall; preference	Through interpretation Spence Gulch can be developed into a valuable recreation area. Criteria test scores were increased 11 and 14 percent by including the objective of the visual material in the title. Slides are more interesting than drawings.	Exhibit/Display: Audio/Visual; recall, preference

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Ali, M B	A cognitive approach to understanding the behavior of museum visitors. 1982. London: Institute of Education, University of London.	Examination of visitors' own perceptions of the exhibits and how well the exhibits measured up to the visitors' conception of an "ideal" exhibit on the same topic. The objectives of the study were to measure the "attracting powers" and "holding powers" of the various exhibits and assemblies; to measure the "attractiveness" and "arrestment" of the exhibition; to test the hypotheses that subjects' prior interest in the exhibition was positively correlated with its "attractiveness" and its "arrestment".	observation; interview	378 visitors	behavior; attracting power; holding power; arrestment	The results of the observations of visitor's behavior have indicated which exhibits are attractive and which are not so attractive. Prior interest does influence whether or not an individual is attracted to an exhibit, but it is also clear that other factors are also involved. This study has also shown that it is possible for visitors to express their interest in different topics and that the interest is related to an exhibit's effectiveness as measured by attractiveness of the exhibition, defined and measured behaviorally.	Exhibit/Display; preference, satisfaction, behavior, attraction
Ali, M B	Visitors' attitudes to two old and two new exhibitions at the British Museum (Natural History). Museum Journal, 83(2&3), 1983, 145-148.	Compares visitors' perceptions and evaluations of two traditional galleries ("Minerals and Meteorites" opened in 1881 and the "Whale Hall" opened in 1937) with two new galleries ("Human Biology," 1977, and "Man's Place in Evolution," 1979).	pre- and post-interviews	2,425 visitors	perceptions	Results are used to support why visitors perceive the newer exhibitions more favorably. The traditional exhibitions tended to be less intellectually stimulating, less easy to understand, and less exciting.	Facilities, Exhibit/Display; satisfaction, preferences
Ali, M B, Griggs S A	Evaluating the mankind discovering gallery: Four studies. Toronto, Canada: Royal Ontario Museum, 1989	An extensive evaluation of the Royal Ontario Museum (ROM). This report summarizes four studies: 1) an evaluation of the gallery by ROM staff; 2) assessment of visitors' understanding of the gallery's conceptual arguments and their appreciation of its aesthetic qualities; 3) record of visitors' behavior in the gallery; 4) effectiveness of individual sections of the gallery in which visitors were invited to study a particular section of the gallery followed by in-depth interviews about what they had seen.	self-administered questionnaire; interviews	museum staff and visitors	understanding; visitor behavior; effectiveness of individual sections of the gallery	Study 1: There was a low response rate for this study and as a result the findings do not represent the views of the ROM staff. Of those responding, there were four general themes 1) the concept underlying the gallery was generally approved 2) the majority of respondents felt the gallery was wrongly situated 3) the gallery was criticized as being poorly laid out 4) respondents felt the courtyard area was not conceptually well linked to rest of the gallery. Study 2: Almost all respondents found something pleasing about the Mankind Discovering Gallery. Two-thirds of the sample expressed no particular dislikes of the exhibit. Overall, respondents had a very positive attitude toward the exhibit. Study 3: the flow of traffic within the gallery revealed that the space around the sides and rear of the exhibit was not used by visitors. In each main section of the gallery except the courtyard, 64% or more of the sample stopped at one or more displays. On average, visitors spent between eight and nine minutes at the exhibit. Study 4: The majority of respondents understood the messages intended	Exhibit/Display; knowledge, behavior
Ali, M B, Shaw, K M	Characteristics of ideal museum exhibits. British Journal of Psychology, 75, 1984, 25-36.	Major study in the Hall of Biology at The Natural History Museum-London examines how the general public perceives exhibits and which exhibit characteristics are considered most important.	interviews; questionnaire	20 visitors interviewed; 1,980 visitors via questionnaire	preference	Yielded the definition of "ideal" exhibit. Positive attributes most strongly related to the "ideal" included "makes the subject come to life," "something in it for all ages," and "memorable." Strong negative characteristics included: "badly placed," "confusing," and "attention to it is distracted by other displays." Characteristics that were judged neutral included "involves you," "artistic," and "makes a difficult subject easier."	Exhibit/Display; preference

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Anderson, M C	Litter reduction in an urban park using behavior modification techniques. Dissertation Abstracts International, 42(7-B), Jan 1982, 3014.	Behavior modification techniques were tested to reduce littering and increase cleaning in an urban park setting. In the first experiment, leaflets were handed out to visitors entering the park and observers recorded whether these subjects littered or threw the leaflets away in a trash basket. Each leaflet contained one of eight anti-litter messages or no message which served as the control. In the second experiment, visitors were paid small amounts of money to deposit their leaflets in a nearby trash basket. This experiment investigated the effectiveness of two reward delivery schemes to increase the frequency of subjects redeeming their leaflets. Continuous delivery offered money to all subjects redeeming their leaflets while the lottery offered money only to one in five subjects.	observation	experiment 1: 900 visitors; experiment 2: 700 visitors	behavior	In the first experiment, four behaviorally specific messages reduced littering more than four nonspecific "slogans" but all messages significantly reduced littering over no-message controls. The appearance of the environment was also important: littering was more frequent (20%) in an area littered with leaflets than in a relatively clean area (7%). In the second experiment, the results indicated that the lottery form of delivery was twice as effective for half the cost of the continuous form of reward delivery.	Publication; behavior
Andre, T	Does answering higher-level questions while reading facilitate productive learning? Review of Educational Research, 49(2), 1979, 280-318.	Reviews experimental studies on impact of asking questions on learning, strategies for using questions, and methodological issues on how the effects are measured.				Author presents results that raise doubt as to whether or not answering higher-level questions in text facilitates learning.	Publication; knowledge
Arndt, M A, Screven, C G, Benusa, D, Bishop, T	Behavior and learning in a zoo under different signage conditions. In: D. Thompson, A. Benfield, S. Bligood, H. Shettel, & R. Williams (Eds.), Visitor Studies: Theory, Research, and Practice, Vol. 5, 1993, pp. 245-253.	An experimental study of the impact of three signage conditions (pretest, passive format, and an interactive flip label format) in a Lion exhibit on attraction, holding power (time spent/required time), and recall on a questionnaire.			attraction; holding power; recall	Significant differences were obtained between each of the three conditions with the largest increase in recall for the interactive label condition.	Signs, Exhibit/Display; attraction, recall
Arnell, U, Hammer, I & Nyblø, G (Eds.)	Going to exhibitions (English version.). Stockholm, Sweden: Riksstiftällningar (Sandhamnsgatan 63, 115 28 Stockholm), 1976, 135 pp.	A summary of survey work conducted by Sweden's Riksstiftällningar (Swedish Traveling Exhibitions) during the 1960's and plans for establishing a permanent role at Riksstiftällningar for systematic experimentation with the exhibition as an educational medium.	questionnaire	200 zoo visitors		The study examined visitor expectations prior to visit, how visitors justified their visit, the possible impact of visits on community opinions, long and short-term effects of visits, and indirect impact of visits on people who had not seen a particular exhibit.	Exhibit/Display; preferences, attitude
Arnold, W E	An experimental study of the effects of communicator credibility and attitude change on subsequent overt behavior. Doctoral Dissertation. Pennsylvania State University. 1968.	The relationships operating among communicator credibility, persuasively induced attitude change, and subsequent overt behavior were identified and analyzed. Communicator credibility was defined as the effect of the image of a speaker in the minds of a listening audience prior to the time of utterance.	pre- and post-test questionnaire	734 college students	attitude; behavior	The results of the study indicated that communicator credibility was not effective in producing change in general attitudes, but was effective in producing change in specific attitudes. High initial credibility produced significantly more attitude change than neutral credibility, which in turn produced significantly more change of attitudes than was found in the control group.	attitude, behavior

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Asensio, M, Simon, C	The effectiveness of communicative instruments for blind visitors. In: M. Wells & R. Loomis (Eds.), 1990, Vol. 9 Visitors Studies: Theory, research, and practice (pp. 136-149).	A summary of research with blind and sighted visitors in the Tilologic Museum, a museum sponsored by the National Organization for the Blind and designed specifically for blind visitors. Two separate studies are reported: S1: a tracking study where pathways, time and behavior at the displays were controlled, S2: a pre-post experimental study in which learning was measured under three experimental conditions (Verbal-Only, Touching-Only, and Verbal-Booth-Touching Communication Tools).	observation; pre-post test	museum visitors	S1: pathways; time; behavior S2: learning	S1: Results showed non-systematic paths; little time was spent in front of displays, and little active touching took place for either blind or sighted visitors. S2: the verbal communicative tools had greater impact than the classical Braille facilities; time, behavior, knowledge	
Asensio, M, García, A, Pol, E	Evaluación cognitiva de la exposición 'Los Bronces Romanos en España': dimensiones ambientales, comunicativas, y comprensivas. (Cognitive evaluation of the exposition 'The Bronze Romans of Spain': Environmental dimensions, communications, and comprehension.) Bulletin of ANABAD, 43(3-4), 1993, 215-255.	A group of studies in a temporary archeological exhibit on the questions and results of research on public attitudes, values, and opinions, the public's use of exhibit viewing space, and learning outcomes as measured by the visitor's ability, after viewing the exhibit, to demonstrate and apply their knowledge and understanding of the exhibit's text and concepts.	pre- and post-testing	1,724 visitors	knowledge; understanding	Results showed statistically significant differences in learning outcomes between pre- and post-visits.	Exhibit/Display; attitude, affect, knowledge
Ausubel, D P	The use of advance organizers in the learning and retention of meaningful verbal material. Journal of Educational Psychology, 51, 1960, 267-272.	The purpose of this study was to test the hypothesis that the learning and retention of unfamiliar but meaningful verbal material can be facilitated by the advance introduction of relevant subsuming concepts (organizers).	pre- and post-test of knowledge	120 senior undergraduate students	knowledge; retention	The difference between the means of the experimental and control groups varied significantly in terms of learning. The obtained differences in retention between the experimental and control groups was also significant.	Audio/Visual; knowledge, retention
Ayres, R, Melear, C T	Increased learning of physical science concepts via multimedia exhibit compared to hands-on exhibit in a science museum. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (71st, San Diego, CA, April 19-22, 1999).	The purpose of this study was to determine whether the use of an interactive multimedia exhibit is more effective than a traditional hands-on exhibit in teaching physical science in a museum setting.	pre- and post-test	104 elementary school children	learning; holding power	Results indicate that there is an increase in science learning when students interact with a multimedia exhibit when compared to the hands-on exhibit. Also, there appears to be no significant difference in the holding power of the exhibits. Both exhibits were very efficient in attracting and engaging students, and statistical tests indicate no gender differences in learning or in holding power.	Exhibit/Display; knowledge, attraction
Baas, J M, Manfred, M J, Lee, M E, & Allen, D J	Evaluation of an informational brochure for promoting charter boat trip opportunities along the Oregon Coast. Journal of Travel Research, 27(3), 1989, 35-37.	This study was undertaken to assess the effectiveness of an informational brochure for increasing awareness, interest, and participation in charter boat trip opportunities.	on-site and telephone interviews	1,005 interviewees	awareness; interest; behavior	The brochure did not positively or negatively affect charter trip participation, but did positively influence the other evaluative measures. The brochure appears to be effective only in increasing awareness of charter trip opportunities.	Publication; awareness, interest, behavior
Bargel, R G	The effectiveness of an indirect control message in decreasing the depreciative behavior of remote camping location users. Master's thesis, 1984, Texas A&M University, College Station.	Analyzed what affect a written indirect control message transmitted via a wooden sign had in decreasing depreciative visitor behavior on remote camping locations on Lake Ouachita, Arkansas.	post test only; questionnaire and impact data sheet	119 site observations at 20 remote camping locations	campsite condition; camper behavior	The sign (indirect control message) did not significantly influence most depreciative behavior of remote camping location users.	Sign; behavior
Baricevic, L J	The effect of synchronous slide-tape montage on classroom verbal behavior in college freshman English. Doctoral Dissertation. 1974. Saint Louis University.	This study examined the impact of a slide-tape montage used for class discussion on: 1) student initiated verbal response; 2) indirect teacher verbal behavior, and 3) attitude toward discussion stimulated by the slide-tape montage.	observation; pre-post test	262 undergraduates	behavior; attitude	The slide-tape montage did significantly increase student initiated verbal response. The slide-tape montage did not significantly increase indirect teacher verbal behavior. The slide-tape montage did not significantly improve attitudes toward discussion stimulated by the slide-tape montage.	Audio/Visual; behavior, attitude

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Barnard, W A	Labeling and modality effects in visual learning of museum stimuli. Dissertation, 1981. Colorado State University, Ft. Collins, 85pp.	An experiment was conducted to test the effects of auditory labeling and information modality on visual learning (memory retention of visual input) of artifacts from a museum collection. Specifically, the study attempted to answer the following questions: (1) Does providing auditory labels (e.g., push button auditory narratives on exhibits and tour guide explanations) facilitate the learning and retention of visual stimuli? (2) Is the retention of visual information facilitated or disrupted by auditory labeling? (3) Does the facilitation of visual input retention result from added informational content or from receiving the information through separate sensory channels?	post-test	340 undergraduate students (at CSU)	recognition; recall	Results indicated that recognition and recall were (significantly) dependent upon the type of label provided: 1) names, 2) names and dates or 3) names, dates and significance of each object. Recognition also varied as a function of the relationship of presentation and test modalities: 1) visual stimuli only, 2) auditory stimuli only, or 3) combined visual and auditory stimuli. Results indicated that the effect of labels on visual learning, when assessed with the recognition procedure, was dependent on both label content and the nature of the recognition test.	Signs; recognition, recall
Barnard, W A, Loomis, R J	The museum exhibit as a visual learning medium. Visitor Behavior, 9(2), 1994, 14-17.	A series of experimental studies addressing three issues concerning visual learning (though visual labels or auditory labels) in exhibits: (1) the comparison of free-recall and recognition as measures of visual learning and their practical use in exhibit settings; (2) the impact of number of visual items displayed in an exhibit; and (3) the relationship between time spent viewing objects and retention of visual information.	free recall and recognition posttests	college students	learning; recognition; free recall	The effect of labels depended on both label content and the recognition test itself. Recognition rates were significantly higher for auditory labels. Generally, visual learning was enhanced by brief name-only auditory labels for each object. Authors conclude that: (1) visual learning of exhibit content declines as the number of items in display increases; (2) increasing the time visitors spend viewing all exhibits increases visual learning; (3) providing a succinct and relevant name for each object that connects it to other exhibit content improves retention; (4) delivering information via multiple modalities is superior to either visual or auditory alone.	Exhibit/Display; recall, knowledge
Barnard, W A, Loomis, R J, Cross, H A	Assessment of visual recall and recognition learning in a museum environment. Bulletin of the Psychonomic Society, 16(4), 1980, 311-313.	An experimental study on visual recognition (choosing photographs of previously visited exhibits) and free recall (listing objects from previously visited exhibits).	questionnaire	60 undergraduates	visual recognition, free recall	Both recall and recognition were negatively correlated with number of exhibits viewed. Attention time was positively correlated with recall, but no relationship emerged with recognition. Correlations between familiarity, recognition, and recall were not statistically significant.	Graphics, Exhibit/Display; recall
Barshinger, T, Ray, A	From volcanoes to virtual tours: Bringing museums to students through videoconferencing technology. In Distance Learning 1998. Proceedings of the Annual Conference on Distance Teaching and Learning (14th, Madison, WI, August 5-7, 1998), 1998, 8 pp.	Study at the Children's Museum of Indianapolis examined how two-way audio/visual interactive learning (2WAVIL) technology can be used to help prepare students prior to a museum visit. The study specifically attempted to answer the following questions: What are children's interpretation of their experience in a novel science museum setting and the 2WAVIL link which preceded it? What is the classroom teacher's interpretation of those children's experiences? How do the children's and teacher's interpretation of this experience compare?	interviews, observations, field notes, researcher reflection	4 students and 1 teacher as key informants (interviewed separately)	orientation	Technology was effective in orienting the students to the gallery environment, supporting research that iterates that any type of advanced organizer will have some positive cognitive and/or affective outcomes. Results provide a better understanding of how children think and learn in informal science settings.	Audio/Visual; orientation

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Beck, L	Optimal experiences in nature: Implications for interpreters. <i>Legacy</i> , 4(1), 1993, 27-30.	Research was conducted to determine the characteristics of optimal interpretive experiences attained by wilderness users at Canyonlands National Park in Utah.	interview; questionnaire	66 visitors	noetic (intellectual and imaginative) qualities; visitor learning	As a result of this study, nine parameters of optimal experiences of wilderness recreationists were identified: 1) positive emotional orientation, 2) novelty and escape, 3) aesthetic response to environment, 4) arousal, 5) increased awareness and self-realization, 6) humility and spirituality, 7) noetic qualities, 8) ineffability, 9) ethereal elements.	Audio/Visual, Signs; knowledge
Beer/les, J W	Learning from television and books: A Dutch replication study based on Salomon's model. <i>Educational Technology and Development</i> , 37(2), 1989, 10-13.	According to Salomon's (1981) model, children usually invest less effort in television viewing than in book reading, with the result that information from television is less deeply processed than information from books. This is a replication study which determines the internal structure of the Dutch versions of Salomon's instruments and test some predictions following from the model.	questionnaire	140 Dutch elementary school children	amount of invested mental effort; perceived self-efficacy	Books are perceived to be more difficult than television. However, unlike their American peers, Dutch children do not unconditionally perceive television as an easy medium.	Publication, Audio/Visual; perception
Bhargava, M, Donthus, N, Caron, R	Improving the effectiveness of outdoor advertising: Lessons from a study of 282 campaigns. <i>Journal of Advertising Research</i> , 34(2), Mar/Apr 1994, 46-55.	Examination of outdoor advertising effectiveness and mediating factors. Tested the impact of respondent-related, message-related, and campaign-related variables on the recall of outdoor advertising.	interview	282 outdoor campaigns	awareness; recall	This study confirms that various marketing-related variables (i.e., product price, awareness of advertiser) are significantly related to recall. The type of outdoor media explained about 20% of the variation in recall scores. The communication of benefit and the use of humor were both significantly related to recall. The use of photograph/artwork is significantly related to recall.	Exhibit/Display; awareness; recall
Birney, B A	Brookfield Zoo's "Flying Walk" Exhibit: Formative evaluation aids in the development of an interactive exhibit in an informal learning setting. <i>Environment and Behavior</i> , 20(4), 1988b, 416-434.	The "Flying Walk," an interactive exhibit at the Brookfield Zoo, addressed the misconceptions that birds flap their wings up and down when they fly. Prior to its final development, a prototype was formatively evaluated to determine attraction and holding power, exhibit usage, and, if participation with exhibit led to learning.	observation; interview	observation data (n=338); interview (n=109)	time; attraction; participation; learning	Attraction and time spent in building increased (47%). Almost all subjects used exhibit in a consistent and appropriate manner. Posttest scores for learning were significantly greater than baseline (45% vs. 4%).	Exhibit/Display; time; satisfaction, attraction
Birney, B B	The influence of social groups on the use of selected <i>Northern Shores</i> graphics at the Denver Zoo. In: D. Thompson, A. Benefield, S. Bligood, H. Shettlel, & R. Williams (Eds.), <i>Visitor Studies: Theory, Research, and Practice</i> , Vol. 5, 1993, pp. 234-243.	The overall goal of the evaluation was to review visitors' response to a select group of <i>Northern Shores</i> graphics to determine the kinds of graphics the Denver Zoological Foundation might want to invest in for the future exhibits. Specific evaluation questions were raised regarding the ability of selected graphics to attract visitors and hold visitors' attention.	observation; interview	1,193 groups and 742 individual visitors	attraction; holding time	Individual graphics differ in their ability to attract and hold visitors. Those that offered visitors the opportunity for a hands-on experience had the strongest attracting power. Younger adults and frequent visitors are more likely to respond to interactive graphics than are older visitors.	Facilities, Graphics; time; attraction

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Blitgood, S, Hines, J, Hamberger, W, Ford, W	Visitor circulation through a changing exhibits gallery. In A. Benetfield, S. Blitgood, H. Shettel (Eds.), Visitor Studies: Theory, Research, & Practice, Vol. 4, 1992, Jacksonvill, AL: Jacksonville State University, Center for Social Design, pp. 104-114.	The current study consisted of tracking visitors through five traveling exhibits to help answer the following questions: 1) How much influence does the spatial arrangement of objects within a gallery have on the behavior of visitors? 2) How much do the characteristics of exhibit objects influence visitor behavior? 3) How effective are techniques for increasing visitation to a changing exhibit hall?	observation	visitors	behavior (patterns)	The arrangement of objects in these exhibitions had a strong influence on visitor behavior. Linear traffic flow appears to increase the chance that all exhibit objects will fall within the visitor's line-of-sight. Attractive exhibits (exhibits that pulls visitor in one direction or another) influence how visitors circulate through the gallery. Spatial arrangements involving exhibit islands create pockets of low attention. At least two methods were found to increase visitation in the gallery: 1) placing objects along the hallway leading to the gallery; 2) playing music in the hall.	Exhibit/Display; behavior
Blitgood, S, Patterson, D	The effect of gallery changes on visitor reading and object viewing time. Environment and Behavior, 25(6), 1993, 761-781.	Systematic changes were made in an Egyptian mummy exhibit gallery and visitor reactions were assessed in terms of effects of label characteristics on reading and the effects on visitor behavior.	observation	1,125 museum visitors	reading time; behavior	Several of the factors studied influenced label reading: a) words per label, b) size of letters, and c) location of labels. For the most part, label reading facilitated visitor attention to exhibit objects rather than compete for visitor attention.	Exhibit/Display; time, behavior
Blitgood, S, Pierce, M, Nicols, G, Patterson, D	Formative evaluation of a cave exhibit. Curator, 30(1), 1987, 31-39.	This study examined the relationship between lighting level (varied from low, medium, to high) and viewing time and satisfaction.	observation, posttest	museum visitors	satisfaction; viewing time	Medium light produced longer viewing time and greater satisfaction for all groups, although average viewing time was far below the minimum needed to read exhibit text. Editor's Note: this is an empirical study of different levels of lighting on visitor satisfaction, not a "formative evaluation" procedure, since lighting levels did not evolve from trying out different lighting levels during cave's development.	Facilities; time, satisfaction
Blake, C G	Two methods of presenting promotional message to national forest amphitheater visitors: A measure of effectiveness. 1971. Master's thesis. Utah State University: Logan.	This study was designed to measure the relative effectiveness of two methods of presenting a promotional message to visitors attending outdoor evening amphitheater programs. The purpose of this study was to determine whether or not the two message treatments (narrative and slide-tape) resulted in a significant increase in the number of participants at three daytime interpretive events.	observation	national forest visitors	attendance	Results indicated that the message did increase the number of visitors attending daytime interpretive events. Significant attendance differences were found between the slide-tape treatment and the narrative treatment. The slide-tape message was found to be superior to the verbal message in increasing activity attendance.	Audio/Visual; attendance
Blanchard-Fields, F, Coon, R C, Mathaws, R C	Interferencing and television: A developmental study. Journal of Youth & Adolescence, 15(6), Dec 1986, 453-459.	Examined the extent of interferencing (ability to go beyond the information given and logically related to the information) in 80 adolescents' and 80 young adults' interpretations of 3-minute video segments taken from a prime-time drama series and from rock music videos.	post-test	80 adolescents (mean age 14 yrs) and 80 young adults (mean age 22 yrs)	thinking	Less structured music video segments resulted in higher level inferencing than prime-time dramas. Young adults produced more higher-level inferences than adolescents, and prime-time drama led to more fact-based responses than music video. Confirmation of previous hypotheses that video inferencing involves unique knowledge structures.	Audio/Visual; knowledge
Bloomberg, M	An experiment in museum education. Washington, DC: American Association of Museums (New Series No. 8), 1929.	An important early experimental study of the effects of different methods of school tour instruction on the recall of exhibit material. Methods included formal instruction, approaches to informal exploration, the impact of pre-visit instruction, etc.		children	learning	The author reported that the most significant contributor to learning (i.e. recall of exhibit material) was the preparation children were given prior to the visit.	Facilities; knowledge

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Borun, R	What are school children learning from hands-on science exhibits? In: A. Benefield, S. Bitgood, & H. Shettel (Eds.), 1992, Volume 4. Visitor studies: Theory, research and practice, Jacksonville, AL: Jacksonville State University, Center for Social Design, 121-130.	The purpose of this study is to explore the link between conceptual understanding, free exploration of hands-on science center exhibits, and Piagetian cognitive developmental levels. This study regarding museum effectiveness was intended to develop models for testing visitor response, provide useable information to the museum staff and test the feasibility of a large-scale investigation of science museums.	pre- and post-test	45 children (ages 5-13)	understanding	The level of conceptual understanding on the exhibits requiring concrete thought increased with each developmental group. The pre-concrete subjects demonstrated the least understanding while the post-concrete group had the highest level of understanding. This finding is consistent with the Piagetian developmental theory. For the exhibits requiring formal thought to understand the concept, all groups of subjects had difficulty developing conceptual understanding.	Exhibit/Display; knowledge
Borun, M	Measuring the immeasurable: A pilot study of museum effectiveness. 1977. Washington, DC: Association of Science-Technology Centers.		questionnaire; museum quiz; pre- and post-visit test	100-200 visitors	learning; affect; attitudinal change	The results of the cognitive test show a clear increase in score from pre- to post-visit test. Results of the first rating scale show a clear decrease from pre- to post-visit test in positive feeling about the museum.	Facilities; knowledge; affect; attitude
Borun, M, Adams, K	From hands on to minds on: Labeling interactive exhibits. In: A. Benefield, S. Bitgood, & H. Shettel (Eds.), 1992, Volume 4. Visitor studies: Theory, research and practice, Jacksonville, AL: Jacksonville State University, Center for Social Design, 115-120.	Formative testing of four versions of a rotation device on gravity were designed and tested to correct the common misconception that gravity is due to rotation of the earth. The devices were tested in terms of their ability to help visitors follow directions, sustain visitor attention to the task (and accompanying labels), and to comprehend the concepts that would overcome their misconceptions about gravity.	interviews	visitors	ability to follow directions; attention; comprehension; perception	While adjustments succeeded in getting instructions across and in getting visitors to observe the model's spinning action they did not reduce the rate of the misconception, which remained about 1/3. Visitors successfully learned the concept from one of the labels. Visitors were not able to successfully learn the concepts from the other three labels due to the passive information-receiving role that the visitors were placed in. The effective label required getting information seeking.	Exhibit/Display; knowledge
Borun, M, Chambers, M, Ciegorn, A	Families are learning in science museums. Curator, 39(2), 1996, 123-138.	A report of the first of three phases of a family learning project by the Philadelphia-Camden Informal Science Education Collaborative (PISEC), aimed at identifying characteristics that contribute to successful family learning in science exhibits.	interviews; audiotapes of visitors	families	learning; behavior	In phase-1, seven exhibit characteristics were identified that were associated with family learning, e.g., family can cluster around the exhibit; interactions allows several sets of hands; group discussion is fostered; different learning styles and knowledge levels are accommodated; cognitive links to existing knowledge and experiences are provided, etc.	Exhibit/Display; knowledge
Borun, M, Chambers, M, Dritisas, J, Johnson, J	Enhancing family learning through exhibits. Curator, 40(4), 1997a, 279-295.	An experimental study reporting results from the third stage of earlier research (see Borun, et al, 1996 and Borun & Dritisas, 1997a). This particular study focuses on how enhancements to the four museum exhibits affected the quality of attention and involvement of the multigenerational groups and on how much was "learned."	pre- post-test	400 families	behavior; learning	All four enhanced exhibits yielded statistically significant increases in learning-related behaviors. Also, a "family holding power" (sum of time all family members spent at exhibit divided by total number of family members) also showed significant increases. Only about 50% of the increase in performance indicators is explained by the increase in time. The remaining 50% is explained by other factors such as increased involvement with exhibit.	Exhibit/Display; knowledge
Borun, M, Massey, C, Lulter, T	Naive knowledge and the design of science exhibits. Curator, 36(3), 1993, 201-219.	A 3-1/2 year experimental research and application study aimed at correcting and overcoming the widespread misconception about gravity and testing exhibit designs that shift visitors to more sophisticated explanations. Study consisted of four phases.	open-ended interview	visitors to science center	misconceptions; learning	Hands-on exhibit formats and carefully worded labels significantly altered misconceptions, at least on a short-term basis. The authors note that a) misconceptions were not corrected simply by adding labels that said that misconception was not so; (b) negative statements were easily misread or misinterpreted, and (c) the formative evaluation of labels played an important role in developing an effective label.	Exhibit/Display; knowledge

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Brooks, J A M, Vernon, P E	A study of children's interests and comprehension at a science museum. British Journal of Psychology, 47, 1956, 175-182.	An early investigation by psychologists into the factors affecting the attractiveness and effectiveness of a pioneer Children's Gallery.	questionnaire	100 children between 7-16 years	understanding; comprehension	Children's understanding of any 3 of 5 exhibits selected in order of ranking on child-minutes was ascertained. Scores were poor. Explanations and recommendations were made concerning display and labeling methods.	Exhibit/Display; knowledge
Brown, P J, Hunt, J D	The influence of information signs on visitor distribution and use. Journal of Leisure Research, 1(1), 1969, 79-83.	Do information signs help distribute visitors more evenly? Do information signs stimulate greater use of a previously unsigned roadside rest area?	observation	motor vehicle users	use distribution	A significant statistical relationship was found between the use of information signs and a more even use distribution between roadside reststops and in stimulating additional travelers to stop at the facilities.	Signs; use
Bryant, W L	Experiments with museum labels. Museum Works, 6(4), 1923, 115-120.	A observational study of museum visitor's reactions to various types of labels (i.e., color, location).	observation	museum visitors	attention	Visitors were attracted to brightly colored labels. The average person does not notice a sign placed over their head; they are more apt to turn to the right than to the left when entering an exhibit.	Signs, Exhibit/Display; attraction, attention
Byers, B. J.	Effects of the direction of door opening on visitor flow patterns. Proceedings of the National Interpreters Workshop, 1988, 33-36. Fort Collins, CO: National Association for Interpretation.	Study examined the directional preferences in the flow pattern of visitors inside 19th-century village structures at Old Washington Historic State Park. Flow patterns to the right or the left were recorded as a function of gender, handedness, and direction in which the entrance door opened.	observation; questionnaire	adult visitors	flow pattern	Results indicate that the direction the door opens into a room affects the flow pattern of the visitor. Of the visitors entering a room through a door which opened to the left, 85% turned to the left. Of the visitors entering a room through a door which opened to the right, 59% turned to the left. Results have strong implications for museum design specifically the effective placement and interpretation of exhibits in historic houses and other structures. The traditional right-hand orientation of museum exhibits may need to be reevaluated.	Facilities; flow pattern
Cable, T T, Knudson, D M, Udd, E, Stewart, D J	Attitude changes as a result of exposure to interpretive messages. Journal of Park and Recreation Administration, 5(1), Spring 1987, 47-60.	Do visitor attitudes toward management policies improve as a result of exposure to interpretive messages?	pre- and post questionnaire	1,116 visitors at Pelawawa National Forestry Institute Visitor Center	visitor attitude and behavior	The mean attitude scores of exiting visitors were more favorable than scores for entering visitors for the majority of topics.	Facilities; attitude, behavior
Calver, H N, Derryberry, M, Mensch, I N	Use of ratings in the evaluation of exhibits. American Journal of Public Health, 33(6), 1943, 709-714.	This study examined exhibit ratings done by experts through the examination of the following two questions: 1) Could professional workers agree on the most effective exhibits in the group? 2) Could they also agree in selecting the least effective displays?	questionnaire	271 professionally trained persons; 18,449 lay spectators	judgment/preference	There was considerable disagreement amongst professionally trained persons in terms of their ratings of exhibits. There was also considerable disagreement amongst lay spectators. There was considerable disagreement between the ratings of the professional group and those of the laymen.	Exhibit/Display; preference, satisfaction
Cardinal, B J, Seidler, T L	Readability and comprehensibility of the "Exercise Life" brochure. Perceptual & Motor Skills, 80(2), Apr 1995, 399-402.	Studies suggest that exercise literature tends to be very difficult to read and the writing is not matched to the reading ability of the audience for which it was intended. In one study, the brochure's readability was assessed. In the second study, subjects were tested to assess if they could comprehend the brochure's message.	post-test	56 subjects mean age of 34; 75% of subjects were college graduates	comprehension	Study 1: Findings show that the brochure was written at a level equivalent to that of a scientific journal article. Study 2: Results show that the brochure was incomprehensible for 69.6% of subjects.	Publication; knowledge
Carson, M. G., Knudson, D. M.	Evaluation of national wildlife refuge interpretation. Proceedings of the National Interpreters Workshop, 1996, 297-302. Fort Collins, CO: National Association for Interpretation.	Importance-performance analysis was used to evaluate the interpretive facilities and services of the National Wildlife Refuge System.	questionnaire	390 visitors	satisfaction	Overall, visitors were satisfied with their visit to the refuges; virtually all had used some of the interpretive facilities. Information booths and availability of staff were two areas needing improvement. Visitors wanted more, updated information and staff available to answer their questions.	Facilities; satisfaction

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Cherem, G J	Visitor responsiveness to a nature trail environment. Unpublished doctoral dissertation. 1973. University of Michigan, Ann Arbor.	Visitor employed photography was used in conjunction with a photolog to analyze visitor responses to a nature trail environment at Kensington Nature Sanctuary in Michigan.	qualitative study; content analysis	visitors	attraction; satisfaction	Two factors emerged as major components of the scenes photographed: thematic content (animals, flowers, etc.) and contrast dimensions (a sudden change in scenery, noise, odor, etc.). Together these components predict the appeal and presence of the "universal" trail scenes. The implications of these findings are that if trails were designed using "universal" scenes as "nodes" to build around, they will better satisfy the needs of the hiker.	Graphic; attraction, satisfaction
Cialdini, B. Sagarin, B. Rhoads, K. Barrett, D. Winter, P	Perceived effectiveness of positive and negative messages. Recreation Research Update, Pacific Southwest Research Station, USDA Forest Service, Riverside, CA, 31, Oct 1999.	This study examined what interpreters felt would be the most effective way to present messages (comparing prescriptive-positive wording with proscriptive-negative wording).	survey	148 interpreters	perceived efficacy	Respondents (interpreters) ratings of the effectiveness of positive messages was significantly higher than the perceived effectiveness of negative messages for reducing deprecative activities of visitors.	Publication, Sign; preference
Cohen, M S. Winkel, G. H. Olsen, R. Wheeler, F	Orientation in a museum: An experimental visitor study. Curator, 20(2), 1977, 85-97.	A study at the Smithsonian's National Museum of History and Technology comparing the effectiveness and use of different orientation aids to help visitors find their way around the museum.	observation; interview; questionnaire	visitors	visitor use	Neither the information desk nor written directions received much usage. Signs had the largest effect. Implications for the design of museum orientation systems are discussed in detail.	Signs; behavior, preference
Cole, D N	Written appeals for attention to low-impact messages on wilderness trailsides bulletin boards: Experimental evaluations of effectiveness. Journal of Park and Recreation Administration, 16(1), Spring 1988, 65-79.	How effective are written appeals designed to increase visitor attention to low-impact messages posted on wilderness trailsides bulletin boards?	observation	554 wilderness trail users in Solway-Bitterroot Wilderness, MT	visitor attention	The proportion of hikers who attended to the messages was significantly higher than the proportion of horse riders. The length of time attention was held varied significantly with treatment and length of stay (day vs. overnight), but not with mode of travel (hiker vs. horse rider). None of the more elaborate appeals held the attention of horse riders or day hikers for significantly longer periods of time than the simple appeal. The proportion of visitors who stopped and looked at the messages on the bulletin board when the appeal was posted was not significantly greater than the proportion who stopped and looked at the messages when no appeal was posted.	Signs; attention
Cole, D N, Hammond, T P, McCool, S F	Information quantity and communication effectiveness: Low-impact messages on wilderness trailsides bulletin boards. Leisure Sciences, 19(1), 1997, 59-72.	Do sign-based messages significantly increase visitor knowledge about recommended low-impact practices? Is there a relationship between attention to message and retention of message content? Do two particular sign elements (number of messages; presence or absence of an attractor) effect message attention and message retention?	observation and posttest	506 visitors	attention; knowledge	Results confirm that visitors exposed to low-impact messages on bulletin boards acquire new knowledge about recommended practices. There is a significant positive correlation between message attention and message retention. The proportion of hikers who attended to messages and the length of time they attended to messages increased as the number of messages increased. Results partially supported the hypothesis that attention per message is inversely related to number of messages; the only statistically significant difference between attention to two messages and attention to more than two messages. Message content was inversely related to the number of messages.	Signs; attention, knowledge

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Cone, C, Kendall, K	Space, time, and family interaction: Visitor behavior at the Science Museum of Minnesota. Curator, 21(4), 1978, 245-258.	Summary of the results of research on visitor behavior in the anthropology hall of the Science Museum of Minnesota. The study involved the movement and interaction of family groups in the hall. Specifically, they looked at what attracted their attention and if family members interacted differently depending on their generation and sex.	observation; interview	26 family groups	time spent; recall; interaction of family groups	Movement through the anthropology hall did not correspond to the logical sequencing of exhibits but generally focused on the four exhibits that were large and particularly dramatic. Time spent in front of a single display was brief (averaging 30 seconds). There was a high correlation between time spent in front of an exhibit, recall of that exhibit, and verbal interaction among family members. As visitors moved through the hall there was a consistent decrease in the number of exhibits viewed, the time spent attending to them, and verbal interaction.	Exhibit/Display; time, recall, attention, behavior
Cota, A	The effects of label changes on visitor behavior at an Egyptian mummy exhibit gallery. Thesis. Jacksonsville State University, 1995.						Label; behavior
Cota, A L, Loomis, R J	Three experiments about the effects of various formatting techniques on information recall. Visitor Behavior, 12(3&4), 1997, 16-19.	Three experimental studies investigating the effects on information recall and on visitor preferences of various formats of label (paragraphs, bulleted paragraph, information map, color contrasts, font sizes, length of text).	post-test	experiment #1: 30 visitors; experiment #2: 196 students; experiment #3: 60 students	preference; recall	Recall depends on color contrast (the more contrast between text and background color, the better the recall). Text format and size of font did not affect recall except for experiment #1 where a difference was found between formats.	Signs; recall, preference
Crigler, A N, Just, M, Neuman, W R	Interpreting visual versus audio messages in television news. Journal of Communication, 44(4), Fall 1994, 132-149.	Examined the relative power of visual, audio, and audiovisual TV messages on people's learning of and feelings about political issues.	post-test	90 undergraduate students	learning; feelings	The evidence showed that audio alone was just as effective as an audio and visual presentation for conveying information, including critical interpretation of a news story. There was little difference between the affective responses to the audio and visual channels. Subjects were most emotionally aroused by a combination of the two channels, which is the essential character of TV.	Audio/Visual; affect, knowledge
Crosbie, R L	Measurement and evaluation of visitor center interpretive messages and media. Masters Thesis. Institute of Outdoor Recreation and Tourism. Utah State University. Logan. 1975.	Measurement and evaluation of interpretive visitor center messages and media. Objectives were 1) to determine the applicability of selected readability formulas in differentiating the reading levels of visitor center interpretive messages; 2) to determine the interest holding capacity of selected visitor center interpretive messages; 3) to determine visitor activities and overt interest associated with selected interpretive displays.	observations	530 park visitors	readability; interest	The effect of readability or interest holding capacity was inconclusive. Data adjustments for message length did reveal a correlation of message completion loss due to higher message reading levels. Overt interest of visitors in the interpretive displays was found to be an observable phenomenon. Distraction of interest generally resulted from actions of family and friends and the type of media employed.	Signs, Facilities; attention, behavior, knowledge
D'Agostino, J V, Loomis, R J	Attitudes, beliefs, intended behaviors, and exhibit evaluation. In A. Benfield, S. Bitgood, H. Shettel (Eds.), Visitor Studies: Theory, Research, & Practice, Vol. 4, 1992, Jacksonsville, AL: Jacksonsville State University, Center for Social Design, pp. 92-101.	Assessment of the effectiveness of an exhibit on urban wildlife in Colorado in changing visitor attitudes toward wildlife existing in urban regions.	questionnaire	visitors	attitudes; beliefs	The study demonstrated the utility of the Theory of Reasoned Action for understanding visitor beliefs and attitudes. The study also yielded limited evidence that some attitude change may have taken place as a function of visiting an exhibit.	Exhibit/Display; attitude

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
D'Aguelli, A R, Kennedy, S P	An evaluation of AIDS prevention brochures for university women and men. AIDS Education & Prevention, 1(2), Sum 1989, 134-140.	Used a variant of the importance-performance method to compare the reactions of female and male undergraduates to two different brochures (explicit controversial vs. factual conservative) designed to educate a university community about AIDS and AIDS prevention.	questionnaire	116 female and 107 male undergraduates	preference	Subjects rated the factual conservative brochure significantly higher on accurate information and appropriateness for parents and teenagers. The explicit controversial brochure was rated higher, especially by women, in its safe-sex ideas and ways to talk with sexual partners.	Publication; preference, satisfaction
DeGregoria, L A	The effects of the presence and absence of exhibit labels on visitor interactions at a computer-based interactive science exhibit. Visitor Studies Association Conference Abstracts. 12th annual conference; Aug 3-7, 1999, Chicago, IL, pg. 8.	This study sought to gain insight into the effects of the presence and absence of exhibit labels on a specific exhibit.	observation; video- and audio-tapes	494 non-school group visitors	behavior; demographics; holding time	Holding time decreased for successful prototype labels (PL) groups and increased for unsuccessful PL groups. The number of successful and unsuccessful groups, however, for the before labels (BL) and PL groups did not significantly vary. The results of this study showed that PL were slightly effective.	Labels, Exhibit/Display; behavior, time
DeMoulhe, J F	Visitor behavior as a measure of the educational effectiveness of museum exhibits. Masters Thesis. University of California, Berkeley, 1989.	The behavior of visitors in a museum is a proximate measure or indicator of the educational effectiveness of the exhibits being viewed. This study attempted to correlate educationally effective exhibits with the characteristics those exhibits have in common. Effectiveness was determined in terms of visitor behavior.	observation	750 visitors	exhibit characteristics; visitor behavior	The most effective exhibits are those that attract and hold the visitor's attention while at the same time prompting the most positive behaviors, interactions and gestures. Static displays were found to be the most educationally effective. Exhibits that consist of text and graphics, but containing no objects, are the least effective. Movement is an attractive component to an exhibit, but it does not necessarily insure appreciation of the display by the viewer.	Exhibit/Display; behavior
Derryberry, M	Exhibits. American Journal of Public Health, 31, 1941, 257-263.	Large-scale pioneering study attempted to measure the effectiveness of public-health exhibits on the attraction, time spent at exhibit, and learning of visitors to the 1939 New York World's Fair.	pre- post-test; questionnaires; interviews	visitors	attraction; time spent; learning	Results indicated that the displays of statistical data, graphs, and tables were generally ignored. For those visitors who did read them, holding time was very low and there were no differences in learning or retention between visitors who read them and those who did not.	Exhibit/Display; attraction, time, knowledge
Derwin, C W, Piper, J B	The African Rock Kopje exhibit: Evaluation and interpretive elements. Environment & Behavior, 20(4), Jul 1988, 435-451.	Assessment of effectiveness of interpretive elements of an interactive zoo exhibit (African Rock Kopje exhibit at the San Diego Zoo).	visitor observation and survey	500 visitors observed; 70 visitors surveyed	recall/knowledge; visitor use	Interactive elements significantly helped cognitive recall when compared to information presented without interaction. There was a strong correlation between the length of time spent in the exhibit, the number of panels read, and the number of elements explored. However, an individual's level of education showed only a small correlation with the number of signs read. On the average, younger visitors were more likely to use the interpretive elements than to read panels, while older visitors were more likely to read the panels than to use the interactive elements.	Exhibit/Display; knowledge, use
Diamond, J, St. John, M, Cleary, B, Librero, D	The Exploratorium's explainer program: The long-term impact on teenagers of teaching science to the public. Science Education, 71(5), 1987, 643-656.	This study examined the long-term impact of the Exploratorium on teenage "explainers" whose job is explaining Exploratorium exhibits to the public. This study sought to determine if science museums, through its youth work programs, significantly affected the teenagers' social development, attitudes toward science, and interest in science, teaching, and museums.	survey; interview	881 "explainers"	attitude; interest	Teenagers reported that they had acquired increased self-confidence from their job and had developed people skills. Some reported their job was the major influence in stimulating them to go to college. Others reported their jobs as "explainers" served as a career start. The job also improved their communication skills and subsequent work and school performance.	attitude, behavior

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Dierking, L. D., Koran, J. J., Lehman, J., Koran, M. L., Munyer, E. A.	Recessing in exhibit design as a device for directing attention. Curator, 273, 1984, 238-248.	A study of the effects of placing objects (beetles) in a recessed area.	post-test	7th and 8th graders	learning	Three exhibit experiences were compared: A-recessed; B-not recessed; C-did not see either exhibit but read a short selection about beetles. The unrecessed exhibit produced the highest learning scores, the recessed exhibit produced the next highest scores, and those who did not see either exhibit produced the lowest scores. Recessing may have actually interfered with learning.	Exhibit/Display; knowledge
Dristas, J., Borun, M., Johnson, J.	Family learning in museums: The PISEC perspective. 1998. Philadelphia, PA: PISEC.	Final report of a family learning project by the Philadelphia-Camden Informal Science Education Collaborative (PISEC), aimed at identifying characteristics that contribute to successful family learning in four science exhibits in four Philadelphia museums. The second phase focused on changes to the four exhibits that would facilitate cooperative learning by adults and children. Family learning components (exhibit enhancements) designed to help adults and children learn together were developed, field-tested, revised and installed at each of the four museums.	interviews	400 families	attention; involvement	PISEC has identified seven characteristics of successful family learning exhibits: multi-sided, multi-user, accessible, multi-outcome, multi-modal, readable, and relevant. The four PISEC family learning components, embodying these characteristics, appear to have increased active family learning.	Exhibit/Display; knowledge
Dottavio, F. D., Noe, F. P.	The use of a touch computer system for distributing information to visitors at the 1982 World's Fair. Visions in Leisure and Business, 2(1), 1983, 51-58.	This study examined visitor preferences regarding the use of computers to provide information to visitors of the World's Fair about the Knoxville area to help improve service.	interview; observation	200 visitors	preference	Findings indicate that the developed method is an effective aid, but to increase its efficiency the system must be more consumer oriented. The majority of visitors found the system easy or very easy to use. Only 20% of the visitors to the World's Fair found the kinds of information they were looking for. Approximately 46% stated they would use the information later. Approximately 59% of the respondents found the information innovative.	Computer; preference
Dowell D. L., McCool S. F.	Evaluation of wilderness information dissemination program. General Technical Report, Intermountain Research Station, USDA Forest Service, 1986, No. INT-212, 494-500. In Proceedings, National wilderness research conference: Current research, Fort Collins, CO, July 23-26, 1985.	This paper reports the results of an experiment that evaluates the cognitive and affective changes induced by a minimum impact camping program titled "Leave no trace."	pre- and post-test and one month after experiment	Boy Scouts	knowledge; skills; beliefs; attitudes; behavioral intentions	Results indicated an overall improvement in Boy Scouts' wilderness knowledge, skills, and behavioral intentions after exposure to the program. Retention scores, measured one month after the program presentation, showed significant decreases from post-test scores (although still above pretest scores) which suggests a strong need to reinforce newly acquired information.	Programs; knowledge, attitude, behavior
Dowell, D. L.	Evaluation of a wilderness education program based on cognitive and affective changes. Master's thesis, 1977, University of Montana, Missoula.	An information dissemination program called "Leave No Trace" was evaluated based on changes in cognitive and affective domains of scouts and leaders.	pre- and post-test	215 boy scouts and leaders	knowledge, skills, intentions	Exposure to the "Leave No Trace" program induced significant changes in Boy Scouts' and leaders' wilderness knowledge, skills and intentions to perform specific appropriate minimum-impact behaviors. Effectiveness of the program is not necessarily dependent on who presents the information.	Program; knowledge, behavior
Dwyer, F. M. Jr.	An analysis of the instructional effectiveness of visual illustrations presented via television. Journal of Psychology, 72(1), 1969, 61-64.	Investigated the instructional effectiveness of various visual treatments possessing different amounts of realistic detail when visuals are viewed for equal amounts of time.	pre- post-test	162 students	achievement	Results indicate that some types of visuals are more effective than others in facilitating achievement of specific educational objectives. Instructional effectiveness of visual illustrations appears to be a function of the type of learning task they are designed to facilitate.	Graphics; knowledge

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Dwyer, W O, Huffman, M G, Jarratt, L H	A comparison of strategies for gaining compliance with campground regulations. Journal of Park and Administration, 7(4), Winter 1989, 21-30.	Two field experiments were conducted at Acadia National Park to determine if the generally recognized public information value of a brochure could be extended to increasing visitor compliance with park regulations.	camper violations in experimental and control sites	3,328 camping parties	compliance behavior	Analyses revealed no significant increase in compliance for the groups that received the experimental treatment (a brochure).	Publication; behavior
Eason, L P, Linn, M C	Evaluation of the effectiveness of participatory exhibits. Curator, 19(1), 1976, 45-62.	Comparison of two types of participatory exhibits: visitor operated "demonstration machines" and "open-ended exploratory booths." Three major questions were investigated in this study: 1) Are these two exhibit types effective in communicating information about scientific principles? 2) Is either exhibit type more effective than the other? 3) How effective is a presentation combining the two types of exhibits?	questionnaire; post-visit interview	740 5th-8th graders	learning	Both exhibits produced learning. Students visiting the optics exhibits were able to recall non-vocabulary optical information and were also able to solve optical problems using manipulative skills gained from these exhibits better than controls who did not visit the exhibits. Thus, the optics exhibits were able to provide the student with information in a nontraditional, unstructured learning situation. Both the demonstration machines and activity booth exhibits are effective in communicating scientific principles, however no significant difference in their effectiveness were measured.	Exhibit/Display; knowledge
Evans, T L	Interior signage legibility for people over age 65: A comparison study of four typefaces. Washington, DC: Society for Environmental Design, 1988, 34 pp.	Compares the legibility of four typefaces for use in interior signage with older adult populations in a real-world environment.	post-test	seniors over age 65	legibility	Typographic legibility was found to reflect statistically significant interactions among the variables typographic proportion, size, viewing distance, and upper-case to lower-case typefaces. Americans with Disabilities Act Accessibility Guidelines were found to be too broad to ensure the best legibility of signage for the elderly and visually impaired.	Signs; legibility
Falk, J H	Assessing the impact of exhibit arrangement on visitor behavior and learning. Curator, 36(2), 1993, 133-146.	Does different sequencing of exhibit elements alter visitor behavior and learning?	tracking; interviewing; observation	321 visitors	learning; appeal	Learning outcomes, as defined by the museum staff, were comparable for visitors in both the structured (designed to channel the public into two distinct tracks) and unstructured mode (permitted visitors to move freely anywhere in the exhibit space). However, qualitative measures revealed that visitors to the unstructured version found the exhibition more appealing, and that they also better understood the overall message.	Exhibit/Display; behavior; knowledge; preference; satisfaction
Falk, J H, Weiss, M	Utilizing museums to promote public understanding of science: Early adolescent misconceptions about AIDS prevention. In: D. Thompson, S. Bligood, A. Benefield, H. Shettel & R. Williams (Eds.), Visitor Studies: Theory, Research, and Practice, Vol. 6, 1993, pp. 98-105.	Determination of whether misperception about HIV transmission prevention existed and which, if either, version of the Biology of AIDS exhibit best informed adolescent visitors relative to this topic.	questionnaire	118 visitors (ages 10-15)	comprehension	Results provide extremely strong support for the benefits of the revised, more graphic version of the sexual transmission section of the Understanding AIDS exhibit.	Exhibit/Display; knowledge
Farley, F H, Grant, A P	Arousal and cognition: Memory for color versus black-and-white multimedia presentation. Journal of Psychology, 94(1), Sep 1976, 147-150.	Tested the hypothesis that the incidence of reminiscence over one week would be greater for color than black-and-white multimedia presentations.	Immediate post-test or post-test one day later	52 undergraduate nursing students (aged 19-25 yrs)	recall	Results support the prediction of a significantly greater incidence of reminiscence (recall) obtained after the color rather than the black-and-white presentation.	Graphics; recall
Farragher, P	The effects of a diagnostic and prescriptive instructional strategy on the achievement of high school students learning science from text. Third congress for Research in Science & Mathematics Feb 25-27, 1991, Victoria, British Columbia: Faculty of Education: University of Victoria.	An experimental study of the effect of embedding questions in text.					Publication; knowledge

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Gennaro, E D	The effectiveness of pre-visit instructional materials on learning for the museum field experience. <i>Journal of Research in Science Teaching</i> , 18, 1981, 275-279.	What is learned by school children attending the "Genesis" (omni-theatre presentation about the "Big Bang" theory of the universe and the theory of plate tectonics) experience? To what extent can this be a more effective learning experience if the attention of students is focused on the concepts of plate tectonics and "Big Bang" theory before the field trip to the Omni-theatre? Does preliminary instruction help one ability group of students more than another?	pre- and post-test	105 8th grade students	learning	Previsit instructional material is significantly correlated to learning by students when taking students on certain kinds of field trips. It appears that using the previsit instructional materials is valuable for students of all ability levels.	Orientation/Wayfinding; Audio/Visual; knowledge
Gennaro, E D, Stoneberg, S A, Tanck, S	Chance or the prepared mind? <i>Journal of Museum Education: Roundtable Reports</i> , 7(4), 1982, 16-18.	Grade-school children were given pre-field trip preparation prior to visits to the Omni-theatre at the Science Museum of Minnesota, Minnesota Zoological Garden, and Minnesota Landscape Arboretum in order to evaluate the effects of pre-visit information on learning.	post-test	grade school children	knowledge; attitude	Those who received pre-visit information showed significantly higher post-test scores than children who did not receive pre-visit material. Advance knowledge of what children will be seeing allows for more efficient use of information during the visits. More positive attitudinal changes among students who had participated in the pre-visit activities.	Orientation/Wayfinding; knowledge, attitude
Gilbert, D C, Houghton, P	An exploratory investigation of format, design, and use of UK tour operator's brochures. <i>Journal of Tourism Research</i> , 30(2), 1991, 20-25.						
Goldberg, N	Experiments in museum teaching. <i>Museum News</i> , 10(15), 1933, 6-8.	A brief report on 2 1/2 years of studies on methods to improve the teaching effectiveness of exhibits on children's test performance.	post-test	5th-8th grade children	learning	The most effective methods for all grades on post-test performance were shorter lectures and the preparatory pre-visit classroom materials. Photos with questions were very effective.	Exhibit/Display; knowledge
Gottesdiener, H, Boyer, J	Self-testing on Raphael: How a computer stimulates visitors in an art exhibition. <i>ILVS Review: A Journal of Visitor Behavior</i> , 2(2), 1992, 165-180.	This experimental study concerns the issue of employing various devices within exhibitions aimed at orienting, guiding and focusing the attention of unguided visitors to exhibit content. In this study, visitors could test themselves on their knowledge of the influence of Raphael on French artists.	post-test; observation	museum visitors	attraction/stops; learning; general behavior	Results confirmed the hypotheses that players who interacted with the computer would: (1) stop more often and spend more time at exhibits than non-computer interactors; (2) time spent at the computer would not lessen visitor interest in other exhibits; and (3) encourage social exchanges about the paintings while at the computer.	Exhibit/Display; knowledge
Greenglass, D I	Learning from objects in a museum. <i>Curator</i> , 29(1), 1986, 53-66.	This study investigated the possibility that different levels of structure in an exhibit (e.g., presence or absence of "hints" to help object interpretation) have differential effects on persons with different levels of cognitive structure.	paragraph completion method; test	60 adult visitors	learning	Subjects with low cognitive level learned more from high structure, and subjects with high cognitive level learned as well without structure as with it. Thus, structuring exhibits with leading questions, interactive devices, and other ways of structuring viewer attention may not interfere with viewers who do not need these and may improve the learning of those who do.	Exhibit/Display; knowledge

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Grotelueschen, A. Sjogren, D D	Effects of differentially structured materials and learning tasks on learning and transfer. American Education Research Journal, 5, 1968, 191-202.	An early experimental study of the impact of "introductory" materials (advance organizers) on learning and transfer. This article presents two experimental studies regarding the effects on learning and transfer of experimentally manipulating two variables--structure and sequencing. Experiments examined the following two hypotheses: 1) Performance on a concept attainment task is positively related to the degree to which introductory material studied prior to the learning task is structured. 2) Performance on a concept attainment task is positively related to the degree to which the learning task is sequentially arranged.	pre- and post-test	Study 1: 24 adults; Study 2: 48 graduate students	Intelligence scores; learning time	The results of the experiments supported the hypothesis that introductory materials can facilitate the learning and transfer of a number base concept. There was also significant support for the hypothesis that partially sequenced learning tasks have a facilitating effect on transfer. The materials seemed to be effective with adults of superior intelligence who had little or no prior knowledge of the learning topic.	Publication, Orientation/Wayfinding; knowledge
Guilierrez de White, T, Jacobson, S K	Evaluating conservation education programs at a South American zoo. Journal of Environmental Education, 25(4), Sum 1994, 18-22.	This study attempts to determine the effectiveness of four conservation-education strategies currently in use at zoos in Colombia: 1) zoo workshop in wildlife conservation targeting elementary school teachers; 2) zoo visit preceded by slide show; 3) unstructured zoo visit; and 4) control treatment.	pretreatment and a posttreatment questionnaire	4th graders	knowledge; attitude	Knowledge and attitude scores of students whose teachers participated in the zoo workshop improved significantly. No effects on student knowledge or attitude scores were found for any of the other treatments. Subjects' active participation coupled with adequate preparation and reinforcement of wildlife-conservation information influenced subjects' performance.	Audio/Visual; knowledge, attitude
Gutteling, J M	A field experiment in communicating a new risk: Effects of the source and a message containing explicit conclusions. Basic & Applied Social Psychology, 14(3), Sep 1993, 295-316.	How effective is a brochure containing information about the risks and benefits of a new hazardous technology?	posttest	383 inhabitants of Dutch cities	knowledge; attitude	Results show that the information presented in the brochure influenced subjects' knowledge of the technology, their assessment of the benefits, and their attitude toward the technology. No effects were found for assessment of the risks, feelings of insecurity, perceived threat, or intentions to adopt protest behavior. The explicit conclusions led subjects to judge the benefits of the technology as being greater.	Publication; knowledge, attitude, affect
Haas, N T	Project Explore: How children are really learning in children's museums. In: M. Wells & R. Loomis (Eds.), Visitor Studies: Theory, Research, and Practice, Vol. 9, 1996, pp. 63-69.	Are children really learning in children's museums or are they simply being entertained? If children are learning, what is it that they are learning? What engages and enhances children in the learning process?	observation; focus group; interview	101 children	learning	Young children are learning in children's museums. Most effective learning embodies something novel, cognitively complex, and generalizable outside the museum walls. Furthermore, adult supportive interaction in the form of developmentally appropriate, open-ended questions is critical to a child's learning within the museum context.	Facilities; knowledge
Hammit, W E	A visual preference approach to measuring interpretive effectiveness. Journal of Interpretation, 3(2), 1978, 33-37.	A visual preference approach is tested as a means for measuring the rewards and information received from interpretive opportunities. Visitors to a bog rated photographs of the area for preference and familiarity.	interview	400 visitors	visual preference	Results indicate that preference increased for all photographs after the on-site experience, that independent groups of visitors were quite consistent in their patterns of preference for the scenes, and the visitors were very cognizant of what they had seen as a result of the on-site experience. It is concluded that visitors are receiving, processing, and retaining substantial quantities of environmental information as a result of the on-site interpretive opportunity.	Graphics; preference

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Hammitt, W E	Attention, familiarity, and effective interpretation. Journal of Interpretation, 7(2), 1982, 1-10.	The author proposes a theoretical base for the interrelationship between visitor attention, familiarity and effective interpretation. Author hypothesizes that visitors are more likely to pay attention to things they prefer.	questionnaire	400 visitors	preference; familiarity	Results supported the proposed hypothesis. Visitors were able to identify what they had seen along the trail, and a strong correlation between preference and familiarity was noted. Results support the use of pictures, as supplements or as the primary medium, in conveying both abstract and concrete information to elementary school students. Concrete information was recalled better than abstract information, although recall of concrete information (but not abstract information) declined over time. Progressively more "loaded" presentations resulted in predictable improvement in recall.	Facilities; preference, attention
Hannafin, M J	The effects of instructional stimulus loading on the recall of abstract and concrete prose. Educational Communication & Technology Journal, 31(2), Sum 1983, 103-109.	Subjects were administered 1 of 5 versions of a children's short story: 1) an audiotape presentation (oral condition); 2) a slide presentation of the pictures in the text (simple condition); 3) presentation of the slides plus close-ups of criterion information; 4) combined oral plus simple conditions; or 5) combined oral plus close-up conditions.	immediate post-test; post-test two weeks later	180 3rd graders	recall	The results showed that headings aided recall, search and retrieval of text used in these experiments, but that the position of the headings (marginal or embedded) had no effect. The kind of headings (questions or statements) had no differential effect with readers of different ability, but low-ability participants appeared to do better with headings as questions in the recall of tasks.	Audio/Visual; recall
Hartley, J, Truman, M	The effects of headings in text on recall, search and retrieval. British Journal of Educational Psychology, 53(2), 1983, 205-214.	This paper summarizes the results from nine experiments on headings. The experiments focus on three main variables: (1) the purpose of the task (recall, search or retrieval from familiar and unfamiliar text); (2) the position of the headings (marginal or embedded); (3) the nature of the headings (statements or questions).	post-test	14 and 15 year old students	recall; search; retrieval	The exhibits that were the most difficult to read had the lowest attraction power. This research suggests that up to a point, more words results in more time spent in the exhibit area. Overall, the data suggests that highly readable text is associated with longer viewing times than less readable text. The results also suggest that an exhibit with no text may attract visitors but it will not hold their attention as long as an exhibit that has text.	Publication; recall
Harvey, M L, Barber, R, Lemmons, H	Text readability and exhibit holding power: An exploratory analysis. Visitor Studies Association Conference Abstracts, 12th annual conference; Aug 3-7, 1999, Chicago, IL, pg. 15.	Measured the readability level of exhibit labels with the Flesch-Kincaid readability formula (the formula includes the variables average sentence length and the average number of syllables per word and constants derived from validation research) and measured visitor attention and time spent.	observation	visitors	attention; time spent	Results indicated that visitor understanding of what they would be seeing or learning about the Village was vague--they showed little knowledge of the historic time period in general or whether the buildings were original. Except for the handout brochures with maps, the orientation exhibits and experiences showed large variations in impact. The duration of the visit increased with the amount of previsit orientation visitors received. Visitors with more initial orientation learned (remembered) more basic facts than those without orientation.	Exhibit/Display, Sign; time, attention
Hayward, D G, Brydon-Miller, M L	Spatial and conceptual aspects of orientation: Visitor experiences at an outdoor history museum. Journal of Environmental Education, 13(4), 1984, 317-332.	A study of pre-visit knowledge conducted at Old Sturbridge Village comparing the effectiveness of active media (film, human voice) and passive media (signs, photos) as orientation methods at entrances and exits.	pre- only and pre/post interviews	visitors	knowledge; time spent	The changes in the Fitch House improved visitor perception; did not significantly change visitors' rating of exhibit quality; decreased the average time spent; improved recognition of exhibit themes; and increased awareness of sense of community.	Signs, Graphics; knowledge, time
Hayward, D G, Larkin, J W	Evaluating visitor experiences and exhibit effectiveness at Old Sturbridge Village. Museum Journal Studies, 1(2), 1983, 42-51.	The purpose of this study was to evaluate the effectiveness (visitor perceptions) in one of the residences at Old Sturbridge Village (a re-creation of an early New England village).	pretest/post-test interviews; questionnaires	363 visitors	preferences; exhibit quality; time; recognition; sense of community		Exhibit/Display; preference, time, knowledge

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Herbert, M E	The water pushes it and the wheel turns it. Curator, 24(1), 1981, 5-18.	A report from a field study of students to a single exhibit which included a slide-show, tour, and activities. This study focused on observing students' comments and interactions with one another as a way of gaining insight into the meaning of exhibits for them.	observation; tape recorded conversations	5th and 6th grade students	holding time; learning	Four themes emerged: (a) the realism of the exhibit, (b) how the model worked, (c) fantasies elicited by the exhibit, and (d) explanations of how the sawmill worked. Results discuss the impact of realism on holding time, the stimulation of fantasy, and stimulation of thinking and problem solving. The computer did not appear to distract attention from less dynamic or less interactive units in the exhibition. Furthermore, when a computer was available, visitors remained in the overall exhibition longer, read more, and were aware of more of the exhibition themes. The author concludes that computers that have been integrated with exhibition themes can contribute to visitor experiences.	Audio/Visual; time, knowledge
Hilke, D D, Hennings, E C, Springuel, M	The Impact of Interactive computer software on visitors' experience: A case study. ILVS Review: A Journal of Visitor Behavior, 1(1), 1988, 34-49.	Visitor reactions to an exhibition were monitored both when an instructional computer program was presented and when it was not.	observation; survey	over 10,000 visitors	attention; holding time; awareness	Families that experienced the additional question not only spent significantly more time reading, but were more likely to spend more non reading time at exhibits. Usually, only one family adult member read the labels and relayed the answers to others. The least read label was poorly located and technical. The most read label was least crowded and broken into two sections.	Computers; attention, time, awareness
Hirshi, K D, Screven, C G	Effects of questions on visitor reading behavior. ILVS Review: A Journal of Visitor Behavior, 1(1), 1988, 50-61.	This study examines the possibility that adding a question to existing exhibits, the answer to which can be found in one of the exhibit labels, would increase reading time.	observation	172 visitors	time spent reading or looking at labels; time spent at exhibit	The results showed that the orientation booklets had few effects on visitors' learning experiences when preferences for the booklet format were not considered. It was found that the congruency of booklet formats with visitors' booklet format preferences facilitated learning. Visitors' reactions to the booklets were not sufficient to explain the effectiveness of the booklets.	Exhibit/Display; time
Ho, C-J	The effectiveness of orientation for adult learning in a museum. Unpublished doctoral dissertation, 1993, University of Wisconsin, Madison.	This research sought to understand the effectiveness of the Descriptive and Questioning orientation booklets for adult learning in museums. The research questions were: (1) What was a useful conceptual scheme for grouping museum visitors? (2) Which orientation booklets were particularly effective in relation to one or more types of visitors? (3) What were the criteria of effective orientation booklets in terms of facilitating visitor affective learning? Can marketing research help designers and creative teams ensure that travel brochures present information that is relevant and attractive to the prospective customer?	questionnaires	1,279 visitors	learning	The research clearly showed that the brochure was very much liked, being seen as attractive, well laid out and easy to use. It was highly motivating and increased many people's interest in going to Italy.	Publication; knowledge
Hodgson, P	Qualitative research and tour brochure design. Journal of the Market Research Society, 33(1), Jan 1991, 51-55.		case history	prospective customers	preference; attraction; interest		Publication; preference, attraction, satisfaction
Hodgson, P	Tour operator brochure design research revisited. Journal of Travel Research, 32(1), 1993, 50-52.						
Houser, R L, Houser, E J, Van Mondfrans, A P	Learning a motion and a nonmotion concept by motion picture versus slide presentation. AV Communication Review, 18(4), Win 1970, 425-430.	Compared the effectiveness of using motion pictures versus slide presentations when teaching a motion and a nonmotion concept.	post-test only (labeling)	four groups of university students (total N=41)	learning	From the analyses of the data it is clear that in the case where motion is a defining attribute of a concept it is better to present that concept using motion picture film than by a nonmotion medium such as slides. At least this is true when the motion concept being presented is of a simple and unfamiliar nature.	Audio/Visual; knowledge

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	Computer versus brochure information dissemination as a backcountry management tool. General Technical Report, Intermountain Research Station, USDA Forest Service. 1986, No. INT-212, 501-508; In Proceedings, National wilderness research conference: Current research, Fort Collins, CO, July 23-26, 1985.	This study compares the effectiveness of two decision aids: a brochure and a microcomputer, in influencing backcountry visitors at Rocky Mountain National Park to consider less used sites.	questionnaire	156 visitors	site selection	Both decision aids had a significant effect in redistributing visitors to designated sites, with the computer being more effective than the brochure.	Publication, Computer; behavior, preference
Huffman M G, Williams D R	The use of microcomputers for park trail information dissemination. Journal of Park and Administration, 5(1), Spring 1987, 35-46.	A field experiment compared the computer decision aid to a brochure in terms of trail selection.	mail-back questionnaire	159 visitors	trail selection behavior	Both the computer decision aid and brochure increased selection of targeted trail from 17% with no information provided to 38% with brochure, and 60% with the computer.	Computer, behavior
Huffman, M G, Williams, D R	Applications of a touch-sensitive computer in park settings: Activity alternatives and visitor information. Journal of Park and Recreation Administration, 6(1), Spring 1988, 1-11.	Are touch-sensitive computers effective for disseminating activity alternative information in a national park visitor center (Great Smoky Mountains)?	interview	274 visitors	visitor awareness and orientation	The computer program was able to reduce orientation problems by getting information to users.	Computer, awareness, orientation
		Analyzed the promotional literature produced by state tourist offices to elaborate the imagery and form of tourist worlds in contemporary American culture. Specific analysis focuses on the visual and verbal imagery in the general brochures and state maps.	qualitative rating; quantitative word and visual imagery frequency	Tourist offices from all 50 U.S. states	Promotional imagery; economic interest	Analysis focused on the visual and verbal imagery in the general brochure and, to a lesser extent, the state map for 50 states. States presented themselves in similar ways, describing and affirming their qualities as a "tourist world." States depicted themselves as extraordinary places, with "everything anybody could want" and "something for everybody." Images of mountains, lakes, and pristine forests abounded. The advertisements provided a representation of reality whose meaning lies precisely in its opposition to the everyday life of mass, urban, industrial America.	Publications
Hummon, D M	The effectiveness of three media formats (guided walk led by park naturalist, booklets, and signs) were compared for use on a nature trail at Kinabalu Park, Malaysia.	The evaluation focused on the visitors' ability to comprehend and paraphrase key exhibit concepts, using structured interviews of randomly selected visitors within the gallery area.	multiple-choice, cognitive test	1,194 park visitors	knowledge	The guide treatment scores were significantly higher than the other media treatments; there was no difference between booklet and sign treatments.	Publication, Sign; knowledge
Jacobson, S K	Media effectiveness in a Malaysian Park System. Journal of Environmental Education, 19(4), Sum 1988, 22-27.	Paper presents a case study that explores the process, techniques, and results of analyzing the effectiveness of three museum's websites that were launched in early 1996. The aim of the study was to determine how well the sites were meeting their initial objectives, assess product and market opportunities, and develop performance indicators.	structured interviews	10 visitors	comprehension; ability to paraphrase	Results included inadequate conceptual levels, unfamiliar definitions, misconceptions, and poor recognition by staff of viewer perspectives of exhibit content.	Exhibit/Display; knowledge
Jarrell, J E	Learning from developmental testing of exhibits. Curator, 29(4), 295-306.	Measuring museum website effectiveness: Goals, server logs, and other arcane lore. Visitor Studies Association Conference Abstracts. 12th annual conference; Aug 3-7, 1999, Chicago, IL, pg. 17.	interview; documents review; website review	3 museum websites	website use	The paper describes the effectiveness of varying methods of content presentation utilized by the three museums and the impact of adding new content to the sites.	Computers; time, attention
Jensen, J		What was the impact of specific (exogenous) factors on exhibit viewing time in zoological parks and implications for exhibit design?	ethnographic interviews; observation	501 individuals across 10 exhibits at 6 zoological parks	viewing time	A broad range of factors have a significant influence on exhibit viewing time. The physical characteristics of the exhibit and zoological park have significant effects on viewing time, with increases in exhibit naturalism, exhibit size, and zoo size all leading to increases in viewing time.	Exhibit/Display; time
Johnston, Robert J.	Exogenous factors and visitor behavior: A regression analysis of exhibit viewing time. Environment & Behavior, 30(3), May 1998, 322-347.						

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Jones, P. E., McAvoy, L. H.	An evaluation of a wilderness education program: A cognitive and behavioral analysis. 1988. National Association for Interpretation Research Monograph. Fort Collins, CO: National Association for Interpretation.	The purpose of this study was to examine the immediate and long-term cognitive and behavioral changes that occurred after participation in a wilderness user education program which included both oral presentations and slides.	questionnaire; interview	85 visitors	knowledge; attitude; beliefs	Study results indicated that participants had significantly improved knowledge, attitude, behavioral beliefs and intentions regarding the practice of minimum impact camping techniques both immediately after the program and three months after program attendance. It was found that color increases recall of peripheral visual material (defined as any media content that is not relevant to the basic information, message, plot, or theme being presented) but not central material. There was mixed support for the proposition that color increases liking for and attention to the material presented.	Audio/Visual; knowledge, attitude, belief
Katzman, N. Nyenhuis, J.	Color vs. black-and-white effects on learning, opinion, and attention. AV Communication Review, 20(1), Spr 1972, 16-28.	Examined the effect of color vs. black-and-white on learning, opinion, and attention.	post-test	60 undergraduate students	recall; learning; opinion; attention	Maps, unlike diagrams, are sequentially encoded and abstract graphic displays can adopt maplike characteristics as a result of the context in which they are presented. Experimental outcomes are discussed in terms of interpretive frameworks and prior knowledge.	Graphics; knowledge, attention, satisfaction, recall
Kealy, W A, Webb, J M	Contextual influences of maps and diagrams on learning. Contemporary Education Psychology, 20(3), Jul 1995, 340-358.	Examined influence of graphic patterns and their interpretive context on learning (maps, diagrams).	post-test	128 undergraduates	memory	It was found that the signs increased both preference and familiarity for the spots they interpreted. Generally, visitors preferred scenes containing water, ravines, or the trail. Scenes that were rated high for familiarity were also rated high for preference.	Orientation/Wayfinding, Graphics; recall
Keyes, B E	Visual preference of a forest trail environment. Unpublished master's thesis. 1984. University of Tennessee, Knoxville.	The major objective of the study was to determine the visual preferences of visitors to a forest trail in Great Smoky Mountains National Park. Of particular interest was the relationship between preference and familiarity for various scenes along the trail.	survey	750 visitors	preference; familiarity	Interpretive signs were received quite favorably by hikers of a heavily used, destination-oriented, forest trail with a round-trip length of three miles. Most visitors read all of the signs along the trail and indicated that the presence of the nature signs improved their experience. There was a significant difference in the level of understanding between those visitors who viewed the interpretive sign and those who did not. There was also a significant difference among those visitors who indicated having read the sign and those who did otherwise. Visitors' level of understanding does not vary across socio-economic levels.	Facilities; preference
Keyes, B. E. & Hammit, W. E.	Visitor reaction to interpretive signs on a destination oriented forest trail. Journal of Interpretation, 9(1), 1984, 11-17.	The purpose of this study was to investigate the acceptance by visitors of signs placed along a medium-length, destination-oriented forest trail.	questionnaire	900 hikers/visitors	perception; satisfaction	There was a significant difference in the level of understanding between those visitors who viewed the interpretive sign and those who did not. There was also a significant difference among those visitors who indicated having read the sign and those who did otherwise. Visitors' level of understanding does not vary across socio-economic levels.	Signs; satisfaction
Kirwin, J A	An analysis of the effectiveness of interpretive signing on the accuracy of visitor perceptions in an impressionistic style exhibit. 1983. Unpublished master's thesis. Texas A&M University: College Station.	Examines the usefulness of an interpretive sign on increasing visitor knowledge of an impressionistic art style exhibit. Specifically, the study answers whether or not a structured introduction to an unstructured exhibit enhances visitor knowledge about the exhibit. This study focuses on the evaluation of an interactive computer exhibit in a museum setting. Several aspects of the exhibit's effectiveness are examined: (1) Is the computer exhibit effective in creating or enhancing positive beliefs in adult and college student populations? (2) Is the computer exhibit effective in creating cognitive gains in elementary students (grades 1-3)?	interview questionnaire	107 visitors	knowledge	Adult visitors and college students were found to demonstrate a significant increase in positive beliefs and feelings towards the 'vanishing species of Texas'. There was a significant increase in cognitive gain of the elementary school population following interaction with the exhibit.	Signs; knowledge
Klevans, M	An evaluation of an interactive computer exhibit in a museum setting. Unpublished doctoral dissertation, 1990, University of Texas, Austin.		questionnaire	adult visitors and students	beliefs		Computer; attitude

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Klevans, M-L	An evaluation of an interactive microcomputer exhibit in a museum setting. In: S. Birgoad, A. Benefield & D. Patterson (Eds.), Visitor Studies: Theory, Research, and Practice, Vol. 3, 1990, pp. 237-255.	Can the microcomputer be used effectively in a museum setting to teach first, second and third graders about endangered species in Texas? Can the microcomputer be used effectively in a museum setting to create or enhance positive beliefs about endangered species in Texas?	pre- and post-test questionnaire; observation	213 students; 975 adults (visitors and non-visitors)	knowledge; beliefs	The elementary student population involved in this study demonstrated a significant gain in knowledge about the four endangered species presented in the exhibit. The three groups of students, general public differed significantly in the total questionnaire score with the museum visitors having the lowest initial scores, followed by the general public, and then the college students.	Computer, knowledge, beliefs
Knapp, D	Evaluating the impact of environmental interpretation: A review of three research studies. In: Coalition for Education in the Outdoors Research Symposium Proceedings (3rd, Bradford Woods, Indiana, January 12-14, 1996).	Three research studies examined the impact of environmental interpretation programs on the environmental knowledge, attitudes, and behaviors of student participants. The studies evaluated variables related to entry level (awareness), ownership, and empowerment goals in a behavior change model of environmental interpretation.	pre- and post-test	Study 1: 600 3-4th graders; Study 2: 1,600 4-5th graders; Study 3: middle school teachers and students	knowledge; attitudes; behaviors	Entry-level variables had more short-term impact on students than ownership and empowerment variables. All interpretive experiences based on ecological information increased student knowledge, but only the ecological field trip at Indiana Dunes affected student attitudes and behavioral intentions. Interpretive experiences with ownership and empowerment variables had no effect on student attitudes and behavior.	Programs; knowledge, attitude, behavior
Kool, R	Behavioral or cognitive effectiveness: Which will it be? Musée et éducation: Modèles didactiques d'utilisation des musées. 1985, (pp. 80-84). Montréal: Université du Québec, Société des Musées Québécois.	Are exhibits that are the most attractive to people (interest in setting) the most effective in communicating ideas (task learning)? This study examined the relationship between exhibit characteristics and both cognitive and behavioral measures of effectiveness, and investigated whether those exhibits that are effective by one measure are also effective by the other.	observation	first time gallery visitors	attraction; holding time; cognitive learning; behavior	Results suggested that exhibits that have more "reality" (i.e., large open dioramas, sounds, smells, etc.) do better in terms of behavioral measures of effectiveness (attraction, time spent, etc.) than in terms of cognitive measures. Data indicated an inverse relationship between behavioral and cognitive effectiveness.	Exhibit/Display; attraction, time, knowledge, behavior
Kool, R	The effect of label design on exhibit effectiveness. Musée, 1985, Summer.						
Koran, J J, Jr, Koran, M L, Longino, S J	The relationship of age, sex, attention, and holding power with two types of science exhibits. Curator, 29(3), 1986, 227-244.	Attraction and holding power of hands-on vs. static exhibits are explored as a function of the sex and age of viewers.	observation; survey	visitor	age; sex; attraction; time spent	For all ages, attraction and time increased with the opportunity to manipulate objects. Females spent more time than males and children; early adolescents spent more time than adults. The microscope (condition 3) increased manipulation of all shells in the exhibit and increased viewing time regardless of age.	Exhibit/Display; time, attraction
Koran, J J, Jr, Lehman, J R, Shafer, L D, Koran, M L	The relative effectiveness of pre- and post-attention directing devices on learning from a "walk through" museum exhibit. Journal of Research in Science Teaching, 20(4), 1983, 341-346.	Study asked two questions: 1) Would the cave exhibit be more effective instructionally if the information panel was built into its entrance rather than its exit? 2) Is the cave exhibit more effective instructionally than a control group who walked through similar habitats and viewed a film of other unrelated Florida habitats for the same time period?	post-test only	28 7th and 8th grade students	knowledge; attentional factors	Both exhibit formats significantly exceeded the control; the exhibit does produce learning in its present form. The effectiveness of the two exhibit formats were not significantly different from each other.	Exhibit/Display; knowledge, attention
Koran, J J, Lehman, J R, Shafer, L D, Koran, M L	The relative effects of pre- and postattention directing devices on learning from a "walk-through" museum exhibit. Journal of Research in Science Teaching, 20(4), Apr 1983, 341-346.	How effective is a panel (used as an attention directing and controlling device) prior to entering the cave (Treatment 1) or on exiting the cave (Treatment 2)?	posttest	28 7th and 8th graders	knowledge; attitude	It was expected that a forward-shaping panel would be more effective than a backward-review panel in the tradition of inserted questions in prose research. Although differences were in this direction, they were not significant.	Exhibit/Display, Sign; knowledge, attention

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Korn, R	Self-guiding brochures: An evaluation. Curator, 31(1), 1988, 9-19.	A comparison of the impact of two formats for a self guiding brochure for use in unguided tours through a Japanese Garden. One brochure contained a declarative heading, the other a question heading.	post-test only	visitors	learning; time spent; frequency of reading the brochure; frequency of interacting with display objects; ratings	Learning improved under both brochure conditions; there were no differences in test scores between the two formats. Visitors with low prior knowledge did better with the declarative brochure format.	Publication; knowledge, time
Korn, R	Men and women: Do they experience exhibits differently? In: S. Bilgic, A. Benefield & D. Patterson (Eds.), Visitor Studies: Theory, Research, and Practice, Vol. 3, 1990, pp. 256-262.	Do men and women experience exhibits differently?	observation; interview	421 visitors	behavior; attraction; preference	There was a significant relationship between gender and correctly describing the exhibit's theme (45% of the men and 24% of the women were able to correctly describe the theme). Visitors, both men and women, bring with them prior knowledge and interests. Meaning for visitors is generated from what the museum offers and from what the visitor brings with them to the experience.	Exhibit/Display; behavior, attraction, preference
Kosika, M M	The impact of selected nature center programs on sixth grade pupils. 1975. Doctoral dissertation. University of Minnesota.	The purpose of this study is to develop research tools necessary to gain information basic to making recommendations on the direction of future nature center programs.	pre- and post-test	6th grade pupils	attitude	There was no significant improvement in environmental attitudes due to participation in a selected nature center program. Inner-city subjects showed significantly lower EAS (environmental attitude scores) than suburban subjects. Participation in nature center activities was significantly lower for inner-city pupils and for girls. One's nature activities were found to explain only a very small proportion of one's environmental attitudes.	Facilities; attitude
Krendl, K A	Media influence on learning: Examining the role of preconceptions. Educational Communication and Technology Journal, 34(4), 1986, 223-234.	How do individuals' expectations on the dimensions of preference, difficulty, and learning compare both within and across various activities? What are the differences in the preconceptions of these activities across demographic subgroups? What are the implications of these results for future research on media and learning?	self-administered questionnaire	611 students from 9 schools (elementary through senior high school)	media preconception; media use; literacy; school achievement	One's preconceptions about a particular medium or activity vary across the three fundamental dimensions identified by Clark. Preconceptions differed depending on whether the student was considering the activity based on preference, ease of use, or a need to learn. In addition, results suggest that variable demographic subgroups differ in their preconceptions about activities on the dimensions of preference, difficulty, and learning.	Audio/Visual, Computer, Publication; preference, knowledge
Kuehner, R A, Eisner, G H	Responses of visitors to the Rainbow Trail: An evaluation of an interpretive area in the Lake Tahoe Basin, California. USDA Forest Service Research Paper PSW-131, Southwest Forest and Range Experiment Station, Berkeley, CA. 17 pages.	The object of the study was to evaluate the success of the Rainbow Trail, a Forest Service Interpretive Area in the Lake Tahoe Basin, in promoting enjoyment and learning in relation to the facilities and their cost.	observation; interview; questionnaire	234 visitors	enjoyment; learning	Enjoyment of the trail was high and learning was moderate. Parts of the trail appeared to be more of an attraction than a learning experience. Learning was generally greater for the more highly educated, for backpackers, for those who had engaged in many activities in the Tahoe area, for those who took their time on the trail, and for those who participated in the suggested trail activities. Learning was relatively unaffected by age, by the density of visitors on the trail, or by the size of the visitor's group.	Facilities; satisfaction, knowledge
Kulik, J A, Kulic, C	Timing of feedback and verbal learning. Review of Educational Research, 58(1), 1988, 79-97.	A study of findings on feedback timing and human verbal learning involving 53 separate studies.	meta-analysis	53 studies	feedback; learning	Review of literature suggests that immediate feedback rather than delayed feedback results in the highest levels of learning. Prospective ways to elicit covert responses and providing immediate feedback in informal settings include: audio-tapes, computers, video-tapes, print material, etc.	Audio/Visual, Computer, Publication; knowledge

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Lakota, R A	The efficacy of three visitor learning support systems in producing cognitive and affective outcomes in an art museum. Unpublished Doctoral Dissertation, 1975, University of Wisconsin: Milwaukee.	This study evaluates three learning support systems for their effect on affect, cognition and behavior. The three learning support systems are: 1) advanced organizers (tour map), 2) active review (post-questions with feedback), and 3) imbedded questions (with noncorrective feedback and specific attention-directing statements).	pre- and post-test questionnaire	240 visitors	cognition; affect; behavior	All of the experimental conditions (map, recycling, and audio) were significantly more effective learning support systems than the exhibit alone. Differences among the map, recycling, and audio are not significant. Indicates the importance of learning support systems for museum visitors.	Exhibit/Display; knowledge, affect, behavior
Landay, J, Bridge, R G	Video vs. wall-panel display: An experiment in museum learning. Curator, 25(1), 1982, 41-56.	This research examines the learning which occurred when an interpretive color wall panel and a videotaped presentation supplemented an exhibition of paintings and notebooks by Stuart Davis at the Brooklyn Museum. The study had 4 objectives: 1) measure the amount of time spent with each of the presentations; 2) measure how well the panel and videotape, separately and together, explained the color-space theory; 3) measure the impact of the two presentations on the visitors' enjoyment; 4) determine how the presentations affected the visitors' learning about Davis' theory and the enjoyment of the exhibition.	observation; questionnaire	visitors	time spent; sequence of viewing; learning	The study found that the experimental media (panel, video) increased learning, and that both the video alone and in combination with the panel were more effective than the panel alone. The video alone was nearly as effective as the video-panel condition.	Exhibit/Display; time, behavior, knowledge
Laurio, D R	Live lecture versus slide-tape method of instruction for a health unit of physical fitness. Research Quarterly, 47(4), Dec 1976, 683-686.	Compared effects of a lecture format of instruction with slide-tape instruction in a unit of study on physical fitness.	pre- and post-test	99 undergraduates	learning	Neither method was statistically more effective than the other; it is concluded that both methods of instruction are efficient teaching modes.	Audio/Visual; knowledge
Leonard, W H	Does the presentation style of questions inserted into text influence understanding and retention? Journal of Research in Science Teaching, 24, 1987, 27-37.	The purpose of this research was to determine the relative effects of the presentation style of questions inserted into text materials for students in university introductory biology.	immediate post-test; 4 weeks later post-test	425 college students	knowledge	Four of the six groups reading with questions at the beginning of the paragraph scored significantly higher on the test given immediately after the reading than the group reading without questions. There were no significant differences between any of the group scores for the test given four weeks after reading.	Publication; knowledge
Leong, E K F, Huang, X, Slamer, P J	Comparing the effectiveness of the Web site with traditional media. Journal of Advertising Research, 38(5), Sept/Oct 1998, 44-51.	How do Web managers perceive the effectiveness of the Web on key media attributes versus the traditional media (i.e., television, the press, magazines, radio, direct mail, telemarketing, point-of-purchase, outdoor)? Why do businesses use the Web to advertise?	mail questionnaire	484 randomly selected Australian companies	emotion; information; cost; attracting power; awareness; involvement; action; brand image; corporate image	Findings describe how the advertisers perceive the effectiveness of the Web site relative to eight other main media on ten key media attributes. Website managers perceived websites as excellent for conveying information and detail; cost-effective; a rational medium; effective in precipitating action; effective for both long- and short-term promotional objectives; and effective for changing attitudes.	Computers; attraction, awareness
Light, D	Visitors' use of interpretive media at heritage sites. Leisure Studies, 14, 1995, 132-149.	This study reports a study of visitors' use of three interpretive media (exhibitions, outdoor panels, and stereo-audio tours) and their relationship to visitor attention.	questionnaire; personal exit interviews	1,221 visitors	interest; attention	There is a significant relationship between interest expressed in a medium of interpretation and attention given to it. The medium in which visitors expressed greatest interest (the audio tour) is that to which visitors paid most attention, while exhibitions are rated least interesting and received less attention.	Exhibit/Display, Audio/Visual; attention, preference

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Liwak, J M	Label length and title type as determinants in visitor learning. Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, April 8-12, 1998).	A series of three studies focused on factors affecting whether or not using a question (instead of a word or statement) as a title on a museum exhibit label would increase the visitor's memory of the information presented in the label text. Study One compared the teaching effectiveness of three different types of questions as titles on exhibit labels: textually explicit, textually implicit, and scriptually implicit questions. In Study Two subjects were exposed to a gallery in which half of the labels began with questions and half began with traditional, statement titles. In Study Three subjects were exposed to a gallery that contained either long labels (100 words) or short labels (50 words).	questionnaire	visitors	learning	All three types of questions led to better memory of the label text than did traditional, statement titles, but there was no significant difference in the effectiveness of the three types of questions. Subjects remembered more from labels that had questions in place of regular titles, but remembered more about the visual displays that had labels with regular titles. Subjects remembered more from labels that had question titles regardless of the length of the label. The overall impression of the kiosk system was positive (3.97 on a 5-point Likert scale). The most frequently accessed information by the students included campus maps, maps of shuttle bus routes, stories about the University through the videos and animation, and the financial aid information. The parts that were liked most included video stories about the University and interactive campus maps. The most common reasons cited were liking the media aspects (especially video, audio and animation) and having fun.	Sign; knowledge
Liu, M, Wheel, J	Designing effective multimedia kiosks. Paper presented at the annual World Conference of Educational Multimedia and Hypermedia (Graz, Austria, June 17-21, 1995), Jun 1995, 7 pp.	This research attempted to test a multimedia kiosk (Project iTOWER) at the University of Texas at Austin to answer the following questions: (1) How do users use multimedia kiosks? (2) What information are they interested in? (3) What types of media are they interested in? (4) Will they prefer using multimedia kiosks to other forms of delivery systems and why?	surveys; observation; interview	69 undergraduate and graduate students	visitor use; visitor satisfaction	Slightly more information was retained from messages given by the recorders, the sign was second, and the leaflet was last. The medium most preferred was the recorder, the sign was second, and the leaflet was last. Respondents strongly preferred a combination of media to any single medium being used.	Audio/Visual; use, satisfaction
Mahaffey, B D	Effectiveness and preference for selected interpretive media. Environmental Education, 1(4), 1970, 125-128.	Test the relative effectiveness of three (audio-visual) media (leaflet for self-guided tour; sign designed for self-guided tour; message recorder for self-guided tour) used for historical interpretation at restored Fort Parker Historic Site, Texas.	questionnaire	622 visitors	knowledge; preferences	It was found that despite the fact that the leaflets were attached to the visitor's validation cards, only one-third of the visitors read their leaflets. The control group (no leaflets) scored higher on facts about littering than the other groups. Groups who were told how to dispose of litter scored higher on the idea that the USFS should do more to control litter. Those receiving the "punishment" leaflet left their campsites cleaner than the other groups, followed by the control, reward, and fact group.	Audio/Visual; Publication, Sign; knowledge, preference
Marler, L	A study of anti-litter messages. Journal of Environmental Education, 3(1), 1971, 52-53.	The effectiveness of three types of anti-litter leaflets (distributed to campers and picnickers in campgrounds in the Uinta National Forest) were evaluated: 1) control leaflet with punishment theme; and 2) leaflet with facts about littering.	survey	118 user groups	opinions; awareness; motivation; knowledge	Results indicated that 88% of visitors viewing the exhibit said they would take action to help rain forests. Response to the educational content was very high. The results of this study indicate that the exhibit was more attractive to children than adults.	Publication; behavior
Mask, D L, Burns, A L	A formative and preliminary summative evaluation of the "Kongo Ranger Station," In: D. Thompson, A. Benefield, S. Bligood, H. Shettel, & R. Williams (Eds.), Visitor Studies: Theory, Research, and Practice, Vol. 5, 1993, pp. 205-211.	The "Kongo Ranger Station" is an interactive display focusing on conservation, natural history, and cultural issues in West and Central Africa. This study is a formative evaluation of the "Kongo Ranger Station" display.	observation; exit interview	28 5th-graders; 75 visitors	time spent; type of interaction; recall		Exhibit/Display; time, recall

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
McAvoy, L H, Hamborg, R	Wilderness visitor knowledge of regulations: A comparison of visitor contact methods. Journal of Interpretation, 9(1), 1984, 1-10. It's the company you keep... The social determination of learning-related behaviour in a science museum. International Journal of Museum Management and Curatorship, 6, 1987, 263-270.	Compared effectiveness of wilderness visitor contact methods and examined visitors' knowledge of regulations within the Boundary Waters Canoe Area Wilderness (BWCAW).	telephone interview	100 visitors	knowledge of regulations	Study results indicated that: 1) although inappropriate behavior was prevalent in the area, there was generally a high degree of regulation knowledge among sampled visitors; 2) Forest Service facilities and brochures elicited a higher degree of regulation knowledge from respondents than did other contact methods; 3) long-time visitors (5+ visits) scored significantly higher than short-time visitors (1-5 visits) on a test of their knowledge of regulations.	Publication; knowledge
McManus, P M	The study investigates the relationship between social group composition and learning-related behavior at five exhibits in the British Museum (Natural History).		observation	visitors	social group composition; learning-related behavior	The author suggests that observed variations in behavior may act as filters for communication if the exhibits do not cater to a matching range of behavior. Results underscore the notion of multiple audiences for museum communications.	Exhibit/Display; behavior, knowledge
McManus, P M	Oh, yes, they do: How museum visitors read labels and interact with exhibit texts. Curator, 32(3), 1989, 174-189.	This paper is based on the finding of McManus (1987). The author presents a theoretical psycholinguistic framework for approaching the "conversational relationship" between the text writer and the visitor.	observation	visitors	reading behaviors	Characteristics of text that affected visitor satisfaction included: establishing a reference, adherence to the topic, readability, conciseness, conversational tone, and social tone. Data also showed that directives and other authoritarian statements were not acceptable to most visitor groups. When directed to interact with a hands-on exhibit and when the visitors could not see its purpose, many responded negatively.	Sign; satisfaction, attention
McManus, P M	Memories as indicators of the impact of museum visits. Museum Management and Curatorship, 12, 1993, 367-380.	This is a review of previous work that looks at visitors' recollections for evidence of visit impact. The results of a pilot study conducted of a hands-on gallery at the Birmingham Museum and Art Gallery are also reported.	questionnaire	28 visitors	recall	The results showed that the exhibit had an impact on visitors ("[the exhibitors] produced a communication which was memorable") and that the "context for that communication" was also memorable. The four categories which emerged from the data (memories related to objects or things, memories related to episodes and experiences, memories of feelings experienced and judgments made at the time of the visit, and "summary memories" based on past memories) could be used in an a priori way in further studies.	Exhibit/Display; recall
Moeckel, N J	Active language in interpretive trail signs and rules leaflets: Its effects on visitor enjoyment and information retention. 1977. Master's thesis. Ohio State University.	The purpose of this study was: 1) to determine if visitors find an active language style more enjoyable to read than a passive language style, 2) to determine if visitors' immediate information recall will be more accurate and more complete when they have read information written in an active language style than when they have read the same information written in a passive language style.	questionnaire	180 nature center visitors 13 yrs or older	enjoyment; information retention	Based solely on the data from the questionnaires there was no significant difference between active and passive language.	Publication; satisfaction, recall

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
More, M A E	The effects of Interpretation on visitor learning and activity choice in natural areas. Doctoral Dissertation. University of Massachusetts. Aug 1978.	Does exhibit type (dynamic vs. static) influence short and long term recall of exhibit content and/or visitor recreation choice?	questionnaire	395 museum visitors	recall; visitor choice	Dynamic exhibits facilitated short term but not long term recall of information; people preferred the dynamic exhibits to the static exhibits; visitor characteristics and aspects of museum visitation had limited effect on recall; amount of time spent viewing the test exhibits was very brief unless the exhibit had some attention holding characteristic; dynamic exhibits were more effective in influencing visitor choices of subsequent sanctuary activities.	Exhibit/Display; recall; preference
Morgan, M	Understanding the effects of cognitive dissonance during Interpretation: Implications for 'hands-on' programming. Legacy, 7(4), Sept/Oct 1996, 24-27.	Field experiment to test the effects of three different interpretive programs on students' attitudes toward live, nonpoisonous snakes. The three programs are: (1) slide presentation + observation of live, nonpoisonous snakes; (2) slide presentation + observation of live, nonpoisonous snakes + observation of an interpreter handling a live snake; (3) slide presentation + observation of live, nonpoisonous snakes + observation of an interpreter handling a live snake + opportunity to touch live specimens.	posttest only	502 students	attitude	Some support for use of hands-on techniques with live snakes during interpretive programs. Attitudes show improvement from each of the treatments, although some treatments did not meet the requirements for statistical significance.	Audio/Visual; attitude
Morrissey, K	Visitor behavior and Interactive video. Curator, 34(2), 1991, 109-118.	Studied whether an interactive videodisc program could be effective as a conceptual pre-organizer for a special bird exhibit at the Michigan State University Museum. The study asked three questions: a) Does interaction with the videodisc program increase visitor time within the exhibit itself? b) What types of visitors use the program? c) How do visitors interact with the program?	observation	366 visitors	time spent	Visitors in the experimental groups spent significantly more time in the exhibit area than did those in the control groups. Thus the use of the videodisc increased the visitors' attention to the exhibit.	Audio/Visual; time
Moscardo, G	How great is the Great Barrier Reef? A formative evaluation of an interpretive brochure. Visitor Studies Association Conference Abstracts. 12th annual conference, Aug 3-7, 1999, Chicago, IL, pg. 20.	The evaluation had three objectives: (1) to determine whether visitors would read the brochure (2) to test the brochure's effectiveness at communicating its intended messages (3) to describe visitor perceptions of the brochure.	survey; observation; survey measuring knowledge; focus groups	visitors	attention to brochure; effectiveness in communication; perception	Many visitors did not take or read the brochure. The brochure had very little impact on visitor knowledge. The brochure was positively evaluated by visitors.	Publication; attention; satisfaction; knowledge

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Moscardo, G M	Communicating with two million tourists: A formative evaluation of an interpretive brochure. <i>Journal of Interpretation Research</i> , 4(1), 1999, 21-37.	A formative evaluation of a brochure designed to communicate messages about the Great Barrier Reef (GBR) World Heritage Area. The first goal of the study was to examine the effectiveness of different methods for distributing the brochure. The second goal of the study was to test the brochure's effectiveness at communicating its intended messages.	survey	673 tourists	knowledge; satisfaction	There were no significant differences between the conditions for overall satisfaction with the GBR experience and satisfaction with the amount of interpretation available. None of the methods for distributing the brochures (brochures given to everyone; brochures given to every group; and brochures left for collection) was effective at getting visitors to read the brochures. The brochure was associated with an increase in awareness of the World Heritage Area (WHA) status of the GBR among the oldest group. The brochure was also associated with an increased likelihood among those aged 31-60 to state that coastal river systems are included in the WHA and a decreased likelihood that those aged under 31 would state that the coastal and river systems are included in the WHA.	Publication; knowledge, satisfaction
Moscardo, G M, Pearce, P L	Visitor center and environmental interpretation: An exploration of the relationships among visitor enjoyment, understanding, and mindfulness. <i>Journal of Environmental Psychology</i> , 6, 1986, 89-108.	This article reported a secondary analysis of material originally collected by the Countryside Commission on 17 British visitor centers. The aims of the current research were to explore more fully the relationship among key variables related to environmental interpretation; namely visitor enjoyment, visitors' information recall, visitor mindfulness and visitors' own beliefs in how much they had learned.	pre- and post-visit interviews	2,963 visitors	recall; enjoyment; knowledge; mindfulness	It was concluded that the link between visitors' information recall and enjoyment across all the centers was minimal, and that this relationship was not being suppressed appreciably by confounding visitor and center characteristics. Further analyses revealed a moderate positive correlation between visitor enjoyment and mindfulness, thus indicating that visitors were being mentally stimulated by their experience in a more general way.	Facilities, Exhibit/Display; preference, knowledge, satisfaction
Moscardo, G, Pearce, P L	Visitor centres and environmental interpretation: An exploration of the relationships among visitor enjoyment, understanding and mindfulness. <i>Journal of Environmental Psychology</i> , 6(2), Jun 1986, 89-108.	Do relationships between key variables related to environmental interpretation affect visitor learning? Evaluated the comparative effectiveness of an in vivo presentation, a personally written letter, and an impersonal brochure in modifying subjects' attitudes toward the appropriateness of personal/social, vocational, and college routine concerns for discussion with a counseling psychologist.	questionnaire	17 British visitor centers	learning	It was found that the link between visitors' information recall and enjoyment across all the centers was minimal and that this relationship was not appreciably reduced by confounding visitor and center characteristics. Further analyses revealed a moderate positive correlation between visitor enjoyment and mindfulness, thus indicating that visitors were mentally stimulated by their experience in a more general way. Cross-tabulations revealed a significant relationship between interpretive theme (historic and conservation as opposed to general) and visitors' mindfulness, increased information recall, and enhanced perception of how much they had learned.	Facilities; knowledge
Nathan, E, Joanning, H, Duckro, P, Beal, D	Differential effectiveness of written and verbal communications in modifying students' perceptions of the counseling center's role. <i>Journal of Counseling Psychology</i> , 25(3), May 1978, 242-245.		posttest questionnaire	157 university students	attitude	Results suggest that simple presentation of the facts was enough to correct attitudes toward vocational and college routine concerns. With regard to modifying attitudes concerning personal/social concerns, the in vivo procedure was not significantly more effective than the personal letter.	Publication; attitude

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Nedzel, L N	The motivation and education of the general public through museum experiences. 1952. Unpublished doctoral dissertation. University of Chicago: Chicago.	An early comprehensive work involving the study of the potentials for educating the public through museum exhibits. Four experimental conditions (groups) were involved: 1) normal visit conditions (baseline); 2) pretest condition; 3) special signs, or 4) lecture tour.	(time-lapse photography; testing)	> 800 visitors	physical movements; cognitive learning; behavior	Group 1 showed no learning from exhibit; Groups 2 and 3 showed small learning gains; Group 4 showed significant gains. Learning improved with increasing time at exhibit up to a certain point, after which there were negative effects. Viewing sequence had no effect on learning.	Exhibit/Display; knowledge, behavior
Neuman, S B	Is learning from media distinctive? Examining children's inferencing strategies. American Educational Research Journal, 29(1), Spr 1992, 119-140.	Investigated the influence of different media (print and video) on children's interpretations of stories, examining whether different inferencing strategies (INS) are elicited with different media presentations (MPs). Can the interpretive trail be viewed as a valid means of educating children in school-sponsored outdoor education programs as well as adults in recreation activities? Can both children and adults learn equally well through means other than the typical visual/oral method of instruction?	interviews (qualitative)	83 fifth graders	interpretation of stories	There were no significant differences for medium or achievement; nor were there interaction effects. A similar pattern of inferencing strategies was employed by subjects in both print and video forms. These results suggest that the interpretive process may be similar across different media presentations.	Publication, Audio/Visual; perception
Nichols, D R	Enhancing learning in the outdoors. Journal of Physical Education, Recreation, and Dance, 60(2), Feb 1989, 44-46.	Visitors' knowledge and attitudes toward National Park Service fire management policies were compared between participants in two different fire management interpretive programs and two control groups not exposed to interpretive programs.	open-ended five-item knowledge test	160 subjects (adults, college freshman, 5th graders)	adult and child knowledge	Significant learning can and does take place during a recreational interpretive experience and the use of the sense of touch can and will enhance such learning opportunities.	Facilities; knowledge
Nielsen, C. & Buchanan, T.	A comparison of the effectiveness of two interpretive programs regarding fire management and ecology. Journal of Interpretation, 11(1), 1986, 1-10.	An experimental study in a gorilla exhibit of the impact of sounds (waterfalls, animal sounds, wind, etc.) on the impressions and satisfaction of visitors.	post-test only	458 visitors	knowledge; attitude	Individuals in both fire management interpretive programs showed significantly higher scores on knowledge and positive attitude than the control groups. No difference in knowledge or attitude existed between interpretive groups. Both the visitor center and the interpreter can educate park visitors about natural resources and increase visitor support for management policies.	Programs; knowledge, attitude
Ogden, J J, Lindburg, D G, Maple, T	The effects of ecologically-relevant sounds on zoo visitors. Curator, 36(2), 1993, 147-156.	Investigated the ability of multimedia presentations to persuade. Specifically, the study examined the effect of presentation format on the attitude change of message recipients with either a low or high degree of personal involvement with the message issue. Two presentation formats were used: a printed brochure and a multimedia computer kiosk.	interviews	visitor	impressions; satisfaction	Significantly greater impact on zoo visitors experience when relevant natural sounds were present than when they were not.	Exhibit/Display, Audio/Visual; satisfaction, preference
Ottlinger, L L	Understanding the effectiveness of multimedia technology as a persuasive tool: An experimental investigation. 1993. Doctoral Dissertation. Texas A & M University, 159 pages.	Investigated the ability of multimedia presentations to persuade. Specifically, the study examined the effect of presentation format on the attitude change of message recipients with either a low or high degree of personal involvement with the message issue. Two presentation formats were used: a printed brochure and a multimedia computer kiosk.	pre- and post-test	108 graduate students	attitude; satisfaction	Multimedia (a multimedia kiosk and a brochure) format was more persuasive in both cases of issue involvement; multimedia format had a more positive effect on attitude change. Multimedia presentation was more popular than its printed counterpart. The vividness (the ability of a presentation to attract and hold the attention of a viewer) factor of the presentations was an important factor in both attitude change and user satisfaction.	Audio/Visual, Publication; attitude, satisfaction
Parsons, L	Systematic testing of display techniques for an anthropological exhibit. Curator, 8(2), 1965, 167-189.	An experimental study of visitor traffic patterns, label reading, and learning from an American Indian exhibit at the Milwaukee Public Museum.	questionnaire	2,000 visitors	preference	In the comparison of didactic versus do-it-yourself exhibits, the difference was so slight that they are considered nearly equal in terms of effectiveness. In the comparison of complex vs. simple displays, the simplest layout proved to be the least successful in almost all tested aspects. In the comparison of color vs. black-and-white, when the colors of the exhibit were greatly limited they did just as an effective job of communication as those exhibits which utilized as many as eight harmonious colors.	Exhibit/Display; behavior, attention, knowledge

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Parsons, M, Loomis, R	Visitor traffic patterns: Then and now. 1973. Washington, DC: Smithsonian Institution, Office of Museum Programs.	An early report of a behavioral observation study of visitor circulation before and after installation of an exhibit in the Hall of Pharmacy at the National Museum of History and Technology.	observation	visitors	exhibit processing; time spent	Over 40% of visitors passed along only one wall before exiting and about 30% passed along one wall and part of an adjacent wall. Objects located along the shortest route between entrance and exit received the greatest amount of viewing time. Adding a new exhibit in Hall of Pharmacy had no effect on total time. Time at the new exhibit simply was taken from time at other exhibits. Traffic patterns were different on crowded days.	Exhibit/Display; time
Pearce, P, Moscardo, G, Woods, B	The effectiveness of pictorial symbols for audiences from different nationalities: A marine environment assessment. Visitor Studies Association Conference Abstracts, 12th annual conference; Aug 3-7, 1999, Chicago, IL., pg. 21-22.	This study examined the effectiveness of eight symbols designed to illustrate appropriate audience behavior for multinational visitors to the Great Barrier Reef.	survey	700 multinational visitors	knowledge; behavioral intentions	The study found relatively high levels of pre-existing knowledge about appropriate reef behaviors for most language groups. The Chinese audience benefited most from the pictorial symbols with text, while the Japanese audience did better with the symbols alone. At a generic level, this research challenges the value of pictorial symbols for complex environmental behaviors with different nationalities as the target audience. There are some broader frameworks of cross-cultural communication, such as levels or layers of meaning, which help illuminate the specific study findings.	Graphics; knowledge, behavior
Pearl, B	Impact of exhibit type on knowledge gain, attitudes, and behavior. Curator, 27(2), 1984, 220-237.	Knowledge, attraction power, holding power, interaction, and attitudes were studied under five exhibit variations which exemplify exhibits ranging from abstract to concrete: (1) label only; (2) picture + label; (3) object only; (4) standard exhibit with picture + label; (5) same standard exhibit with added sound; (6) control condition.	pre- and post-test	336 visitors	knowledge; attraction power; holding power; interaction; attitudes	Most knowledge gain occurred under condition 5 and progressively lesser amounts for conditions 2, 4, and 1 in this order. No differences were obtained between condition 3 and posttest only. The presence of a label was critical. No changes in attitude were obtained between control and any of the exhibits. Exhibits that offered three dimensions and real objects attracted many more people than those with print and a flat image only.	Exhibit/Display; knowledge, attraction, time, attitudes
Reis, J	Learning assessment project. 1973. In: René Marcoussé (Ed.), Museums Annual, 5, 8-13. Paris: ICOM International Committee for Education and Cultural Action.	A comparison of the effectiveness of several visitor interpretive strategies on visitor behavior, attitudes toward modern art, and post-visit cognitive learning.	post-test	350 adults	learning	No significant differences in learning were detected between the baseline, unadulterated exhibit group, or the extra label group. Both the audio-label group and expert-token groups scored significantly higher than the other groups, but did not differ from each other.	Exhibit/Display, Audio/Visual; knowledge
Rayburn, J H, Knudson, D M	The influence of advertising on attendance at park programs. Journal of Environmental Education, 7(2), 1975, 59-64.	What is the influence of advertising on the attendance at park programs?	questionnaire	26,956 visitors at five parks	attendance	Direct oral communication is the most effective way to promote attendance at park programs, however, it can be time consuming and not cost effective.	Program; behavior

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Robinson, P V	An experimental study of exhibit arrangement and viewing method to determine their effect upon learning of factual material. 1960. Unpublished doctoral dissertation. University of Southern California. Los Angeles.	The purpose of this study was to: 1) determine the effect of arrangement of selected exhibit installations upon the learning and retention of factual material; 2) determine the effect of two viewing methods upon the learning and retention of factual material; and 3) explore the relationship between exhibit arrangement and viewing method upon retention of factual material.	observation; pre- and post-test	216 sixth-grade students	learning; retention	All groups learned significant amounts of information from the exhibit. Exhibit arrangement had little to contribute as a source of variability among the groups in immediate recognition of material. The lecture was the major source of differences in learning rather than type of material. Exhibit arrangement produced no variability in terms of retention scores. The graphic-photographic versus active-passive involvement techniques produced no significant differences in the immediate post-test; active involvement proved significantly superior to graphic-photographic technique in conveying factual information; in retention, the involvement techniques indicated that active involvement approached significance. Active involvement assisted in immediate acquisition of factual information; active-passive involvement differences were not significant.	Exhibit/Display; knowledge; retention
Roggenbuck, J W, Berrier, D L	A comparison of the effectiveness of two communication strategies in dispersing wilderness campers. Journal of Leisure Research, 14, 1982, 77-89.	In an experimental design, two communication strategies (a brochure alone and a brochure plus personal contact) were used to attempt to disperse wilderness campers from a heavily used meadow.	observation	291 camper groups	behavior	The brochure alone was surprisingly stable across various segments of the camper population. The brochure plus personal contact was much more variable and was more effective for certain user groups.	Publication; behavior
Roggenbuck, J W, Hall, O F, Oliver, S S	The effectiveness of interpretation in reducing depreciative behavior in campgrounds. Waterways Experiment Station. U.S. Army Corps of Engineers (PO: DACW-39-81-M-2264), Department of Forestry, Virginia Polytechnic Institute and State University, Blacksburg, VA, Jan, 1982.	The specific objectives of this study were: 1) To identify the amount and nature of depreciative behavior in campsites. 2) To determine the relative effectiveness of interpretive programs which vary in message and channel of communication on reducing depreciative behavior. 3) To determine whether site or user group characteristics influence response to interpretive messages.	post-test	campers	depreciative behavior	The findings of this study suggest that interpretation can be used to significantly reduce certain types of depreciative behavior in campgrounds. In this study a simple brochure distributed by personnel at the contact station reduced physical damage to trees and campsites littering by approximately 50%.	Publication; behavior
Sariscsany, M J, Pettigrew, F	Effectiveness of interactive video instruction on teacher's classroom management of declarative knowledge. Journal of Teaching in Physical Education, 16, 1997, 229-240.	Comparison of the Interactive Video Classroom Management Training Program (IVCMTP), a teacher-directed videotape, and a traditional lecture instructional mode for instructional effectiveness in developing candidates' declarative knowledge of classroom management.	25-item multiple choice pre- and posttest	77 preservice elementary and early education majors	knowledge	The interactive video instruction program group scored significantly higher than the teacher-directed video instruction group, the teacher-directed instruction group, or the control group.	Audio/Visual; knowledge
Saunders, C D, Birjulin, A A, Bacon, L, Glieseke, T J	Can an exhibit affect visitor conservation behaviors? Visitor Studies Association Conference Abstracts. 12th annual conference, Aug 3-7, 1999, Chicago, IL, pg. 23.	The purpose of this study was to develop useful ways to measure behavioral intentions of zoo visitors, and to use those measures to see if an exhibit experience can influence such intentions.	interviews using card sorts; self-report surveys	400 visitors (card sorts); 760 (self-report survey)	behavioral intentions	Factor analysis suggests there are at least two dimensions underlying the 22 behaviors, which tend to separate according to welland-related and more general conservation behaviors. Interest in doing many of the welland-related behaviors is significantly higher for people who spent a lot of time in "The Swamp" exhibit.	Exhibit/Display; behavior

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Schnackenberg, H L, Savenye, W C, Jones, H	View the zoo! Evaluation of visual communication in an outdoor educational setting. Paper presented at the Annual Meeting of the Association for Educational Communications and Technology (Albuquerque, NM, Feb 12-16, 1997), Feb 1997, 7 p.	How do various forms (exhibits, educational activities, conservation programs) of visual communication vary in outdoor education settings?	pre- and post-surveys, interviews, observation	30 zoo visitors	visitor use; learning; preference	About one-quarter of the visitors reported that they learned the difference between "venomous" and "poisonous." Sixteen of the 26 visitors made positive comments about the signs in the exhibit. Ten visitors thought the signs were too small. Visitors viewed the exhibit for an average of 2.94 minutes (with a range of 10 seconds to 10 minutes and 25 seconds).	Exhibit/Display; use, knowledge
Scraven, C G	Public access learning: Experimental studies in a public museum. 1973. In: R. Ulrich, T. Stachnik, & J. Mabry (Eds.), The control of human behavior: Volume 3. [pp. 226-233]. Glenview, IL: Scott-Foresman.	A series of experimental studies were conducted at the Milwaukee Public Museum and the Milwaukee Art Museum. Visitor learning was studied at a traditional passive exhibit and the same exhibit supplemented with a punchboard, question answer unit, and/or handheld audiocassette. A separate retention study tested visitors 2 and 16 days after exposure to experimental conditions to assess retention of the learning after museum visit.	pre- and post-test	visitors	learning; retention	In the visitor learning study, significant improvement in posttest performance occurred under the conditions of taking a pretest prior to seeing the exhibit. Audio-alone also resulted in significant increases in posttest performance. The punchboard had no effect over the audio alone. In the retention study, results were similar to post-test scores obtained at museum for the various conditions. Learning and retention under the pretest-only experience suggests that learning might be facilitated if visitors simply had the opportunity to test themselves on the exhibit's topic prior to or during exhibit visits.	Exhibit/Display; knowledge, retention
Scraven, C G	The effectiveness of guidance devices on visitor learning. Curator, 18(3), 1975, 219-243.	Experimental study comparing the impact of different visitor guidance devices at an exhibit on glass at Renwick Gallery of the Smithsonian Institution.	pre- and post-test	visitors	learning	While inserted question labels had a significant effect on post-test scores and punch board activity added to these scores, the three audio conditions, by far, had the most impact on post-test scores. External and self-paced audio were the same. The flip-booklet also had a dramatic impact on post-test scores, but there were fewer booklets completed, probably partly because of the greater perceived time.	Exhibit/Display, Labels; knowledge
Scraven, C G	The Measurement and Facilitation of Learning in the Museum Environment: An Experimental Analysis. Smithsonian Institution Press. Washington, DC. 1974. Pp. 32-36.	In one study, four groups of subjects were tested under four exhibit learning conditions: (1) punchboard and cassette tape; (2) audio cassette only; (3) exhibit itself (no punchboard or audio cassette); (4) exhibit itself, but subjects were directed to the exhibit before taking the criterion test on the test machine. The second included a comparison of: (1) audio cassette only; (2) exhibit itself (no punchboard or audio cassette); (3) audio cassette only without the five-second silence following the questions; (4) audio cassette without the questions.	S1: questionnaire; pre- and post-test design S2: questionnaire	S1: 201 visitors S2: visitors	learning	S1: The use of the audio cassette without the opportunity to overtly respond to questions on the punchboard was equally effective (as the use of the punchboard) in producing significant improvement in the learning for many visitors. S2: There were no differences between the audio cassette without the punchboard and the audio cassette without the five second silence following the questions. The exhibit alone did not differ significantly from the audio cassette without the questions. The audio conditions involving questions were both significantly greater than no audio at all.	Exhibit/Display; knowledge
Scruton, C H	Effects of control on presentation of exhibit information on subsequent visitor behavior. 1992. Unpublished doctoral dissertation. University of Wisconsin: Milwaukee.	An experimental study at the Milwaukee Public Museum of factors affecting time spent and level of attention of noncued visitors at an exhibition of representative houses of European ethnic groups and nationalities in a village of the 1800's and in which no labels or guidance were used.	observation	276 visitors	attention time; focus of attention; level of involvement	The practical benefits of providing "advance organizing" materials at German House (via informative labels) was supported. Informative labels increased focused attention and holding time, interaction, etc. Time and attention at German house under both label conditions generalized in progressively lesser amounts from most similar to least similar.	Signs; attention

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Searles, H	Interpreting and evaluating with micro-computers. Visitor Behavior, 2(3), 1987, 5-6.	A brief summary of preliminary results of a field study employing a micro-computer as an interpretive tool at the Ohio Historical Society.	computer test	visitors	attention; holding time; interaction; learning	Results showed some improvements in attention, holding time, and more active, focused interaction with the computer. The use of micro-computers for interpretive purposes has attracted large number of visitors for long periods of viewing and interaction time.	Computer; attention, time, knowledge
Serrell, B	Paying attention: The duration and allocation of visitors' time in museum exhibitions. Curator, 40(2), 1997, 108-125. The evolution of educational graphics in zoos. Environment and Behavior, 20(4), 1988, 398-415.	The intent of this study was to obtain a large database of visitor attention patterns that encompassed both overall time/square feet visitors spent in an exhibition as a whole, and the number of stops each visitor made at the individual elements of the exhibition.	unobtrusive time and attention observation	visitors	holding time; attraction power	Results showed that: (a) visitors typically spent less than 20 minutes in an exhibition, regardless of their size and topic; (b) the majority of visitors did not stop at more than 50% of available exhibit elements; (c) on average, visitors used exhibitions at a rate of 200-400 square feet/minute; (d) visitors typically spent less time per unit area in large exhibitions and diorama halls than in smaller or nondiorama exhibitions.	Exhibit/Display; attraction, time
Serrell, B	We are here: Three years of wayfinding studies at Brookfield Zoo. In Proceedings of the American Association of Zoological Parks and Aquariums (pp. 577-585). 1985. Nashville, TN: Association for Zoological Parks and Aquariums.	Summary of three years of field studies at Brookfield Zoo examining the effectiveness of design, content, and placement of wayfinding signage.	observation; interviews	visitors	wayfinding effectiveness	Conclusions included: (a) words with symbols are more effective than each alone; (b) simple drawings are better attractors than detailed drawings; (c) high contrast is more attracting than bright colors; (d) the color green should be avoided; (e) directions to nearest restroom always should be indicated; (f) emblems embedded in Fiberglass help reduce vandalism.	Facilities, Sign; behavior
Shettle, H H	Atoms in Action Demonstration Center impact studies: Dublin, Ireland and Ankara, Turkey. 1967. Washington, DC: American Institutes for Research (Report No. AIR-F58-11/67-FR).	A report of four surveys carried out to assist Atomic Energy Commission in evaluating public impact of the "Atoms in Action Demonstration Center" in its visits to countries with small or nonexistent programs of the peaceful applications of atomic energy. Phase 1 was concerned with the effectiveness of the media in attracting visitors, the demographics of those who attended and those who did not, and the expectations of those who attended and their overall impression of the exhibit and its sponsor. Phase 2 was concerned with the impact of the exhibit on the visiting public in terms of knowledge gain and attitude change, and with likes and dislikes relating to exhibit content and presentation formats.	personal interviews	1,340 visitors	knowledge gain; attitude change; preferences	Results showed: (1) small but significant immediate gain in knowledge about peaceful uses of atomic energy; (2) an overall favorable impression of the exhibit; (3) a positive change in attitude towards atomic energy from war-related to peaceful uses; and (4) a small but positive change in attitude toward the USA (its support of peaceful applications of atomic energy throughout the world). An important finding was that while specific knowledge about the peaceful uses of atomic energy decreased over the 7-month period of Phase 2, attitude changes produced by the exhibit remained at about the same level.	Exhibit/Display; attraction, satisfaction, knowledge, attitude
Shettle, H H, Butcher, M, Cotton, T S, Northrop, J, Slough, D S	Strategies for determining exhibit effectiveness. 1968. (Report No. AIR E95-4/68-FR). Washington, DC: American Institute for Research.	This early pioneering study explores the roles of different research/evaluation strategies in contributing to the effectiveness of educationally-oriented exhibits. Exhibit effectiveness is defined as a measurable change in behavior of the intended audience produced by an exhibit, consistent with its stated aims and objectives.	observation; interview	visitors	knowledge gain; interest; attitude levels; behavior	Results indicate that an exhibit can be analyzed using a wide variety of techniques and that studies of this type can make a major contribution to improved exhibit design and effectiveness.	Exhibit/Display; knowledge, attitude, behavior

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Shiner, J W, Shafer, E L, Jr.	How long do people look at and listen to forest-oriented exhibits? USDA Forest Research Paper NE-325. Forest Service, USDA, 1975, Northeastern Forest Experiment Station, Upper Darby, PA.	Describes the differences between required reading or listening times and the time actually spent reading and listening to the exhibits for a variety of information and education exhibits.	observation	420 visitors	viewing time	Visitors looked at displays only 15-64% of the total time required to read or listen to the message presented. Usually, the longer the printed or recorded message a display contained, the shorter the viewing time.	Exhibit/Display; time
Silbergliitt, B	The use of audio and prosthetic devices to improve and evaluate exhibit effectiveness. Unpublished doctoral dissertation, University of Wisconsin-Milwaukee, 1972.	Evaluation of a program exposing museum visitors to a recycling, response-reward contingent environment where some sort of visitor response was encouraged on audiotape.	post-test only questionnaire	350 visitors	performance	The hypothesis that exposing museum visitors to a recycling, response-reward contingent environment would result in visitors performance superior to that of visitors exposed to a self-paced tape when material to be learned involved complicated abstract concepts rather than being basically factual in nature was not borne out by the data.	Audio/Visual; behavior
Sipprell, L E	Fear-Arousal as a means for increasing awareness of hazards in national park settings (safety). 1984,Utah State University. Dissertation Abstracts International, 45(09B), pg. 2887 (204 pp.).	What is the pragmatic efficacy of using a fear-arousal slideshow to enhance visitor safety at Timpanogos Cave National Monument (TCNM).	observation	visitors	attitude; behavior	At TCNM a fear-arousal message was causally linked with safer attitudes regarding hazards, safer behaviors among youth groups hiking the trail to the cave, and safer behaviors among children and parents (family units). Limited generalizability of study results to other national parks.	Audio/Visual; attitude, behavior
Sneider, C I, Eason, L, Friedman, A J	Summative evaluation of a participatory science exhibit. Science Education, 63(1), 1979, 25-38.	This paper reports the results of an experiment to evaluate the STAR GAMES exhibit with respect to three educational goals of knowledge, psychomotor skills, and interest.	post-test only	139 high school students	knowledge; psychomotor skills; interest	STAR GAMES does increase visitors' knowledge, does develop visitors' psychomotor skills, and does positively affect visitor preferences. The study also found that older subjects performed better than younger subjects; girls improved more than boys.	Exhibit/Display; knowledge, preference, behavior
Stevenson, J	The long-term impact of interactive exhibits. International Journal of Science Education, 13(5), 1992, 521-531. An evaluation of visitor use of a self-guided trail at Mud Volcano, in Yellowstone National Park. Masters' Thesis, North Carolina State University, 1998.	Family visitors to a science museum were interviewed for their recall of exhibit experiences associated with various categories: spontaneous, photographs, comments by family members, as well as what was recalled from exhibit use (emotions, underlying concepts). How many visitors use self-guided trail and trail brochure at Mud Volcano in Yellowstone National Park?	interviews	79 family visitors	recall; attitude	The study provides evidence of how individuals in an interactive science center interact with and observe exhibits, mostly in association with others. The results show that immediately after their visit, everyone is able to talk about the exhibits in detail and to distinguish between them. The follow-up interviews provide evidence of the long-term impact of the exhibit on visitors. Visitors recall not only what they did with the exhibit but also how they felt and thought about them. Most of the recalled memories were episodic in nature. Some visitors made it clear that their attitude toward science and technology were now more positive.	Exhibit/Display; recall, attitude
Stewart, C D		How do visitors use interpretation to enhance their sense of place? To what extent does interpretation fulfill, initiate and extend visitors sense of place? Does interpretation move visitors towards a "field of care"? What other significant ways do visitors come to understand Mount Cook?	observation; survey	7,231 visitors	visitor use	Self-guided trail brochures provided at Mud Volcano were not the primary way visitors gained information; signage was determined to be the most useful interpretive service.	Publication; behavior, use
Stewart, E.J, Hayward, B M, Davlin, P J	The "place" of interpretation: a new approach to the evaluation of interpretation. Tourism Management, 19(3), 1998, 257-266.		interview; observation	60 Mt. Cook visitors	sense of place; visitor use and understanding of interpretation	The results of this research suggest that visitors to the national park can be classified into four groups depending on their use of interpretation. These categories are termed: seekers, stumblers, shadowers and shunners. Interpretation at Mount Cook is deemed effective in extending all but the "shunners" understanding of the park as a special place.	satisfaction

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Stoneberg, S A	The effects of pre-visit, on site, and post-visit zoo activities upon the cognitive achievement and attitudes of sixth-grade pupils. 1981. Unpublished doctoral dissertation. University of Minnesota: Minneapolis.	This study determined the effects of four instructional treatments on the cognitive achievement and attitudes of students. The treatments consisted of participation in (1) three types of learning activities, seven pre-visit activities conducted in the classroom prior to a visit to the Minnesota Zoological Garden (MZG), an on-site learning excursion at the zoo, and seven post-visit activities completed back in the classroom; (2) an on-site learning excursion alone; (3) all pre-visit and post-visit activities without participation in the on-site visit; and (4) none of the zoo activities described above (the control).	cognitive pre- and posttest, attitude pre- and posttest; zoo evaluation questionnaire	1671 sixth grade students	cognitive gains; attitude	Significant cognitive gains were produced in students subjected to each experimental treatment but one, the control. Schools exposed to treatments #1 and #3 significantly outperformed those receiving treatments #2 and #4. Also, students from suburban and out-state schools showed significant cognitive gains over those from urban schools. Significant improvement in environmental attitudes due to exposure to the four treatments were not noted; however, they were found among schools in different settings. Students from out-state schools demonstrated greater (though small) improvements in attitudes than students from suburban or urban schools.	Facilities: knowledge, attitude
Stronck, D	The comparative effects of different museum tours on children's attitudes and learning. Journal of Research and Science Teaching, 20(4), 1983, 283-290.	This study examined the value of field trips and museum visits to improve learning and attitudes.	questionnaire	816 students grades 5-7	learning; attitude	The study concluded that students had significantly greater cognitive learning when they participated in a more structured tour (i.e., one led by a museum docent). Students had significantly more positive attitudes when they participated in the less structured tour (i.e., one guided only by their classroom teacher).	Exhibit/Display; knowledge, attitude
Talbot, J F, Kaplan, R, Kuo, F E, Kaplan, S	Factors that enhance effectiveness of visitor maps. Environment and Behavior, 25(6), 1993, 743-760.	The focus of the series of studies is on the effectiveness of handout maps as wayfinding aids for museums and on the importance of wayfinding to the quality of the museum visitors' experience.	survey	700 visitors	behavior; satisfaction; preference	Visitors are eager to use handout maps and find them helpful even when they contain few details. Visitors who were given simple handout maps reported more positive expectations of their visit and satisfaction levels were higher among exiting visitors who felt that they had been able to find their way around the museum more easily.	Orientation/Wayfinding; behavior, satisfaction, preference
Taylor, R	The influence of a visit on attitude and behavior towards nature conservation. In: D. Thompson, S. Bligood, A. Benfield, H. Shettel & R. Williams (Eds.), Visitor Studies: Theory, Research, and Practice, Vol. 6, 1993, pp. 163-171.	An assessment of exhibit effectiveness in changing awareness, beliefs and attitude toward plant conservation.	questionnaire	185 visitors	awareness; beliefs; attitudes	In terms of awareness, the reasons respondents gave for conserving plant species varied significantly between pre and post groups, with more functional and ethical comments from the group who had seen the exhibit. In terms of beliefs, results show a significant difference for general environmental actions, but a non-significant response for donating money. In terms of attitudes, visitors to the botanic gardens had positive environmental attitudes which did not vary significantly between visitors questioned before or after visiting the display.	Exhibit/Display; awareness, beliefs, attitude

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Thompson, D	Effects of identifying objects as "originals" versus "copies" on attraction and holding time. ILVS Review: A Journal of Visitor Behavior, 2(1), 1991, 121-123.	This study addresses the possibility that perceptions of objects as originals or copies may affect attraction (stops), holding time, or other behaviors, and thus indirectly, learning outcomes. This exploratory study tested the hypothesis that museum objects in a Plains Indian display that were labeled "original" will be more effective in initially stopping passing visitors than when the same objects were labeled "copy."	observation; questionnaire	638 visitors	stops; holding time; behavior; affective impact; cognitive impact	Differences in holding time were not statistically significant. Pointing, touching, talking were higher for the "original" label condition; reading aloud was lower. No significant differences between affective or learning scores were found between the two conditions. The latter results could have been distorted by the nearby presence of a full-size Indian teepee that drew people from the target area which could have limited holding times and, indirectly, learning scores. Conclusions on learning impact also are problematic because of the limited information available in the labels and the kinds of questions used to evaluate learning.	Exhibit/Display; time, behavior, affect; knowledge
Thompson, D, Bligood, S	The effects of sign length, letter size, and proximity on reading. In: S. Bligood, J. T. Roper, Jr. & A. Benfield.(Eds.), Visitor Studies: Theory, Research, and Practice, 1988, pp. 101-112.	The effect of three variables (label length; type size; and position of the label) was examined in terms of visitors' usual circulation path through the exhibit area.	observation	5,822 visitor groups	attracting power; holding power	Label length influenced visitor reading. However, there was no statistically significant effect in terms of attracting power as related to the number of words on the sign. There was an increase in reading by visitors as the type size increased. There was no significant differences in either attracting or holding power that were attributed to changes in type size.	Sign; attraction, time
Treisman, J, Gregg, J P	Visual, verbal, and sales responses to print ads. Journal of Advertising Research, 19(4), Aug 1979, 41-47.	Eye-tracking (viewing time) and verbal (purchase interest) data were analyzed for 6 pairs of Avon brochure advertisements for products that had previously been sold.	eye-tracking device	100 people	viewing time; sales	As hypothesized, the combination of eye-tracking and purchase interest data was better in predicting sales results than either type of information considered separately.	Publicatation; time, behavior
Vance, C L, Schroeder, D A	Matching visitor learning style with exhibit type: Implications for learning in informal settings. In A. Benfield, S. Bligood, H. Shettel (Eds.), Visitor Studies: Theory, Research, & Practice, Vol. 4, 1992, Jacksonville, AL: Jacksonville State University, Center for Social Design, pp. 185-200.	Study examines visitor learning style preference and its effect upon learning in an informal education setting. Subjects were placed in one of four conditions: 1) baseline; 2) non-cued technique; 3) "intuitive" labels; and 4) "sensing" labels.	questionnaire; Myers-Briggs Type Indicator (MBTI)	400 visitors	knowledge; learning style	The results clearly show that there are individual differences in the ways museum visitors process information. Matching visitor learning style and exhibit presentation can result in increased learning. Intuitive learners performed better when intuitive labels were in place, and sensing learners performed better on the questionnaire when sensing labels were in place.	Exhibit/Display; knowledge
VanRennes, E C	Educational techniques in a science museum. Curator, 21(4), 1978, 289-302.	A report of an experimental study of the effectiveness of an inquiry approach to helping 6th-grade children learn from science exhibits at the Cranbrook Institute of Science. Four different delivery systems were studied: 1) teacher-led; 2) written materials with immediate feedback; 3) written materials without feedback; and 4) control group (original labels remained in place).	questionnaire	6th-grade children	learning	The teacher-led group had significantly higher scores over the control group. The groups receiving written materials with immediate feedback did not affect their scores. The group receiving written material without immediate feedback scored the same as the group receiving immediate feedback.	Exhibit/Display; knowledge

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
VanHennes, E C	Exhibits enhanced by stand-alone computers. 1981. ERIC Document Reproduction Service No. ED 207 523.	Both the development and evaluation of one of a set of computer programs designed for use by visitors as adjuncts to museum exhibits are described. Museum displays used were (1) a static, behind-glass exhibit on evolution; (2) a hands-on primitive stone age tools exhibit; and (3) a Foucault pendulum. A computer placed next to each exhibit served as a simulation of a teacher who asked questions by way of a video screen and received responses keyed in on a typewriter keyboard.	questionnaire	138 visitors	learning	A preliminary study for the evolution program showed that the mean scores test administered via computer were significantly higher for the visitors who had used the computer program for that exhibit than for those who had used one of the other programs. This report also describes the design and results of an experiment to test the effectiveness of one section of the program, and outlines some practical conclusions drawn from project experiences.	Computer; knowledge
Wagar, J	The recording quizboard: A device for evaluating interpretive services. 1972. Portland, OR: Pacific Northwest Forest and Range Experiment Station, PNW-139.	Study measured visitors' retention of specific information presented in the exhibits. The purpose of testing the quizboard was to see if distinguishable differences could be detected from modifications in the presentations.	quizboard	visitors	knowledge retention	Results show that the recording quizboard can tell the interpretive planner which questions are being answered correctly most often and can provide feedback that helps determine the relative effectiveness of various exhibits or other interpretive efforts. The quizboard cannot always identify the exact reason a presentation is effective.	Exhibit/Display; knowledge; retention
Wagar, J A	Cassette tapes for interpretation. 1976. USDA Forest Service Research Paper PNW-207. Pacific Northwest and Range Experiment Station, Portland, OR. 20 pages.	Purpose of this study was to: (1) compare the effectiveness of tapes with that of trail signs and leaflets, (2) compare the effectiveness of taped presentations organized in different ways (control tape, question tape, theme-first tape, theme-last tape, signs only), and (3) examine the administrative and logistic problems associated with issuing tape players.	post-test questionnaire	548 visitors	visitor enjoyment; short-term information retention	Interpretation using portable tape players and cassette tapes provided significantly greater enjoyment and short-term retention of information on the trail than either signs or leaflets. A tape format using cue questions increased retention of the information emphasized, but at the expense of reducing retention of the other information presented.	Audio/Visual; Signs; Publications; recall; knowledge
Washburne, R F	Visitor response to interpretive facilities at five visitor centers. 1972. Master's thesis. University of Washington.	The primary concern of this study was to identify elements of interpretive facilities that are especially effective or ineffective in stimulating interest in visitors and to formulate principles about exhibit effectiveness. This study examined five visitor centers in the Pacific Northwest.	interviews	522 visitor center visitors	interest	Strong differences in preference for exhibits were found at each of the visitor centers. There were four broad patterns in terms of stimulus categories: 1) preference for animated or dynamic media as opposed to those which are inert or not changing, 2) preference for entertainment systems associated with those associated with traditional education, 3) preference for communication systems employing more than one of the senses, and 4) preference for three dimensional presentations.	Exhibit/Display; preference
Washburne, R F. Wagar, J A	Evaluating visitor response to exhibit content. Curator, 15(3), 1972. 248-254.	Are some types of presentation and subject matter preferred more than others? If so, can some general criteria be developed to guide the planning of interpretive facilities?	interviews	visitors	preferences	The preference patterns shown by visitors in this study are consistent with a number of other observations. For example, the marked preference for dynamic, animated, and changing stimuli, and for violent subjects, parallels the direction taken by the major entertainment media-television and motion pictures. Compared with inert flatwork exhibits, dynamic multisense presentations may permit visitors to experience greater involvement with exhibit subject matter.	Exhibit/Display; Audio/Visual; preference

Author	Study	Study Purpose/ Research Question(s)	Data Collection Method	Sample	Variables	Important Findings	Keyword(s)
Webster, N B Jr	Effectiveness of interpretive signs in increasing the environmental knowledge of campers. 1981. unpublished thesis. College Station, TX: Texas A&M.	This study examines the effectiveness of interpretive signs as a supplemental medium which might reach all campers. The criterion for effectiveness was the change in campers' knowledge concerning the natural features which were interpreted.	pre- and post-test	165 campers	knowledge	The testing in this study showed that the use of interpretive signs did significantly increase campers' knowledge, but no testing was done to explain why. Nature program participation and sign location were not significant moderator variables of signs of effectiveness.	Signs; knowledge
Wolf, R L, Tymilz, B L	"Do Giraffes Ever Sit?": A study of visitor perceptions at the National Zoological Park, Smithsonian Institution. Smithsonian Institution, Washington, DC. 1979.	This study explores why people come to the National Zoological Park, the value of their visit, what they learn, and how the overall experience of visiting the zoo affects them.	interviews; observation (naturalistic evaluation)	300 visitors	behavior	Findings indicated that people came to the National Zoo for reasons of tradition, relaxation, entertainment, education, and to observe animals which might soon be extinct. They most enjoyed observing the animals and questioning zoo tour guides for further information. Many respondents indicated a need for self-guided tours.	Facilities; behavior
Wright, E	Analysis of the effect of a museum experience on the biology achievement of sixth graders. Journal of Research in Science Teaching, 17(2), 1980, 99-104.	The test compared the cognitive levels of students before and after a standard three hour visit to the museum or a three hour review session in the classroom.	pre- and post-test of knowledge	sixth graders	recall of facts; knowledge	Analysis of test results showed that students who visited the museum showed superior achievement on the test. Wright concludes that this result supports the notion that multisensory, hands-on experiences provide concrete ways for students to assimilate concepts.	Exhibit/Display; recall; knowledge
Young, C F, Witter, J A	Developing effective brochures for increasing knowledge of environmental problems: The case of the gypsy moth. Journal of Environmental Education, 25(3), Spr 1994, 27-34.	Evaluated the effectiveness of seven different educational brochures in increasing participants' knowledge of gypsy moth infestations and associated action strategies.	questionnaire	859 home owners in 3 urban areas of Michigan	knowledge	Brochures that rated high in communication effectiveness were most useful in increasing knowledge. These brochures used headings and textual connections liberally, explicitly described appropriate behavior, and contained concrete words. A brochure with color photographs, color-coded headings, and other visual features was more effective than predicted despite its less than carefully written text. A highly personalized booklet brochure with a different title and cartoon-like drawings was less effective for increasing knowledge.	Publication; knowledge

Summary Chart of Major Studies by Media Type and Study Variables

Summary Chart of studies by media type and variable(s) studied			
Study Variable	Exhibits	Printed Material/Brochures	Signs/Labels
affect	Asensio, Lakota, Thompson (a)	Gutteling	
attention	Cone, Harvey, Koran (a,d), Light, Parson (a), Shettel (a)	Moscardo (a), Scruton	Cole (a,b), Costlick, McManus (b), Rabb, Scruton
attitude	Arnel, Asensio, D'Agostino, Peart, Shettel (b), Stevenson, Stronck, Taylor	Gutteling, Nathan, Helsen, Ottinger	
attraction	Alt (a), Arnell, Ayres, Birney, Derryberry, Fire, Kook, Koran (a), Korn (b), Peart, Serrell (a), Shettel (a)	Hodgson (a)	Arndt, Thompson
awareness	Taylor		
behavior	Alt (a, b), Bitgood (a,b), Cone, DeGrogia, DeVouten, Falk (a), Kool, Lakota, Landay, McManus (a), Nedzel, Parsons (a), Saunders, Shettel (b), Snelder, Thompson (a)	Anderson, Dwyer, Feldman, Huffman (a,b), Marler, Roggenbuck (a,b), Schild, Stewart, Treisman	Barget, Cohen, Cota (a), Crostic, DeGregoria, Serrell
beliefs	Taylor		
comprehension	Allen, Alt (c), Asensio, Borum, Borun (b), Brooks, Falk (b), Jarrett, Kellert	Cardinal	Crostic
knowledge	Asensio, Borun (e), Derwin, Gottsdienler, Koran (d), Lakota, Parsons (a), Peart, Reis, Shettel (a,b), Snelder, Thompson (a), Vance, Wagar (a), Wright	Feldman, Gutteling, Jacobson, Leonard, Mahaffey, McAvoy, Moscardo (a,b), Neilson, Young	Cole (b), Hayward
learning	Abler, Ayers, Barnard (b), Borun (a,c,d,e), Brooks, Derryberry, Dierking, Eason, Falk (a), Fire, Flexer, Goldberg, Gottsdienler, Greenglass, Hayward, Kool, Koran (b), Landay, McManus (a), Nedzel, Reis, Robinson, Schnackenberg, Screven (a,b,c), Stronck, Vance, VanRennes (a)	Andre, DeVaard, Farragher, Feldman, Fry, Grotelueschen, Ho, Korn(a), Krendl, Screven (b), Wagar (b)	Beck, Litwak
preference	Abler, Allison, Alt (a,b), Bitgood (c), Cone, DeGregoria, Derryberry, Harvey, Hayward, Hersh, Johnston, Kool, Koran (a), Landay, Mask, Parsons (b), Peart, Serrell, Shiner, Thompson (a)	Cialdini, D'Augelli, Hodgson (a), Huffman (a), Krendl, Mahaffey	Adams, Choen, Cota (b)
recall	Allison, Barnard (a, b, c), Cone, Mask, McManus (c), More, Stevenson, Wright	Janiszewski, Moesckel, Wagar (b)	Arndt, Barnard (a), Cota (b)
retention	Robinson, Screven (a), Wagar (a)		
satisfaction	Alt (a,b), Birney, Bitgood (c), Calver, Falk (a), Ogden, Shettel (a)	D'Augelli, Hodgson (a), Moesckel, Moscardo (a,b), Ottinger	Evans
time	Abler, Birney, Bitgood (b, c), Cone, DeGregoria, Derryberry, Harvey, Hayward, Hersh, Johnson, Kook, Koran (a), Landay, Mask, Parsons (b), Peart, Serrell (a), Shiner, Thompson (a)	Korn (a), Treisman, Kullik	DeGregoria, Hayward, Thompson
use	Derwin, Schnackenberg	Stewart	Brown
Note: Not all studies in the annotated bibliography are included in this matrix.			

Summary Chart continued					
Study Variable	Audio-visual	Computer/Technology	Museums in General		
affect	Crigler		Borun (a)		
attention	Light	Hike, Searles, Jensen			
attitude	Baricevic, Gutierrez de White, Johnes, Morgan, Ottinger, Sipprell		Borun (a)		
attraction		Leong			
awareness		Klike, Hultsman, Leong			
behavior	Baricevic, Feldman, Silbergliit, Sipprell	Huffman (a,b)	Asensio		
beliefs	Jones	Klevens			
comprehension	Blanchard				
knowledge	Feldman, Gutierrez de White, Hayward (a), Jones, Mahaffey, Reis, Sariscsany	Klevens			
learning	Beck, Crigler, Feldman, Herbert, Houser, Krendl, Kulik, Laurie, Reis, Vagar (b), Dwyer	Krendl, Kulik, Searles, VanRenes (b)	Allard, Asensio, Bloomberg, Borun (a), Fazzini, Haas, Koran (c)		
preference	Hammitt, Krendl, Light, Mahaffey, Ogden	Dottavio, Huffman (a), Krendl	Allard		
recall	Hannafin, Janiszewski, Vagar (b)				
retention					
satisfaction	Liu, Ogden, Ottinger				
time	Hayward (a), Herbert, Morissey	Hike, Kulik, Searles, Jensen	Asensio		
use	Liu				

Annotated Reference Materials

This section contains annotated sources (books, articles, reference materials) that are not research reports of empirical data collection and analysis but rather:

- **Theory/think piece** — a reference, book, or manuscript that proposes a new idea or suggests a conceptual framework for future empirical study.
- **Study review/meta-analysis** — a review of more than one study that synthesizes a body of research or writing related to a common theme.

Author	Study	Focus	Type of Reference	Keyword(s)
Alt, M B	Evaluating didactic exhibits: A critical look at Shettel's work. Curator, 20(3), 1977, 241-258.	An earlier publication of evaluation techniques and methods (Shettel et al., 1968) is used by the author to question the usefulness of the goal-referenced approach for studying visitor behavior and evaluating the effectiveness of visitor-exhibit interactions and didactic exhibits. Alt proposes an alternative approach to the exploration of visitor-exhibit interactions based on what he considers a cognitively-oriented theory of human behavior.	theory/think piece	Exhibit/Display; behavior
Alt, M B, Griggs S A	Psychology and the museum visitor. In J. Thompson (Ed.), Manual of curatorship: A guide to museum practice. 1984. Pp. 386-393.	The authors propose a "rationalistic" model for studying museum visitors. Interests and expectations are said to influence visitor perceptions which in turn affect decisions to stop at a particular exhibit. The authors question the appropriateness of the "behavioristic model" for designing educational exhibits because it is said to distract attention from visitors' psychology. Suggests the use of human factors research as a tool for obtaining feedback about how well an exhibit is working before it has been completed (formative evaluation). The author describes a cognitive model ("Human Processing Model") as a framework for describing the impact of an exhibit on the nature of these processes, how they work with the senses, and how people learn, understand and remember.	theory/think piece	Facilities; perception
Alter, P, Alter, R	Exhibit evaluation: Taking account of human factors. Curator, 31(3), 1988, 167-177.	Reviews experimental studies on impact of asking questions on learning, strategies for using questions, and methodological issues on how the effects are measured. Author presents results that raise doubt as to whether or not answering higher-level questions in text facilitates learning.	theory/think piece	Exhibit/Display; knowledge, retention
Andre, T	Does answering higher-level questions while reading facilitate productive learning? Review of Educational Research, 49(2), 1979, 280-318.		theory/think piece	Publication; knowledge
Arnell, U, Hammer, I & Nylof, G (Eds.)	Going to exhibitions [English version.]. Stockholm, Sweden: Riksstallningar (Sandhamngatan 63, 115 28 Stockholm), 1976, 135 pp.	A summary of survey work conducted by Sweden's Riksstallningar (Swedish Traveling Exhibitions) during the 1960's and plans for establishing a permanent role at Riksstallningar for systematic experimentation with the exhibition as an educational medium. The study examined visitor expectations prior to visit, how visitors justified their visit, the possible impact of visits on community opinions, long and short-term effects of visits, and indirect impact of visits on people who had not seen a particular exhibit.	theory/think piece	Exhibit/Display; preferences, attitude
Arthur, P, Passini, R	Wayfinding: People, signs and architecture. 1992. New York: McGraw Hill	The notion of wayfinding through the built environment is now accepted by many people, but it has not yet made its full impact on the design profession. This book is an attempt to bring this about. The book includes the following topics: the issue of wayfinding, principles of wayfinding, principles of wayfinding design, architectural components of wayfinding design, graphic components of wayfinding design, audible and tactile components of wayfinding design.	theory/think piece	Orientation/ Wayfinding
Asensio, M, Pol, E	Cuando la mente va al museo: un enfoque cognitivo-receptivo de los estudios publico. (When the mind goes to the museum: A focus on public studies of cognition-perception). In: IX Jornadas Estatales DEAC-Museos: La exposición, 1996a, 83-133.	From a visitor's standpoint, perception of an exhibit's "message" is first created in their own mind; changes in this perception, based initially on existing knowledge (concept maps, misconceptions, etc.), develops under the influence of existing cognitive abilities (rules and strategies) and feelings (attitudes, emotions). How these changes take place are described in terms of the role of questionnaires, uses of exhibition space, impact on attitudes, text, audiovisuals and computers, exhibition comprehension, and formal/informal learning.	theory/think piece	Exhibit/Display; knowledge
Ausubel, D P	Educational psychology: A cognitive view. 1968. New York: Holt, Rinehart, & Wilson.	Ausubel is one of the first authors to utilize the term "advanced organizer," a popular term that refers to efforts to give learners advance information that provide readers, students, visitors, etc., a conceptual framework within which information obtained later can be viewed, sorted, and categorized.	theory/think piece	Orientation/ Wayfinding

Author	Study	Focus	Type of Reference	Keyword(s)
Bligood, S, Serrell, B, Thompson, D	The impact of informal science education on visitors to museums. In V. Crane, H. Nicholson, M. Chen, & S. Bligood (Eds.), 1994, Informal science learning: What research says about television, science museums, and community based projects (pp. 61-106). Dedham, MA: Research Communication, Ltd.	This chapter summarizes the history, issues, and representative studies on visitor-exhibit interactions, giving an overview of the field and of research in the field. Many useful in-depth references are cited as well, primarily in the arena of science museum but with some discussion of art museums. The authors summarize key studies dating back to 1952 and recent exemplary studies.	study review/meta analysis	Facilities, Exhibit/Display; knowledge
Borhegyi, S F de	Testing of audience reaction to museum exhibits. Curator, 8(1), 1965, 86-93.	An early paper that anticipates the current visitor-centered approaches to exhibit planning, design, audience research, and the efforts to objectively measure museum audience and exhibit effectiveness. To find out if designs are working as expected, Borhegyi recommended testing visitors with prospective display layouts, color object densities, crowd flow, pre-visit biases, and fatigue. The author also emphasizes the importance of sequencing and layout of exhibit content.	theory/think piece	Exhibit/Display; preferences
Brown, W S	The design of the informal learning environment. The Gazette, 1978, 4-10.	Distinctions between formal and informal learning environments are made along with analyses of (a) evaluation approaches, (b) exhibit goals, and (c) communication formats. Includes a summary of visitor and exhibit research from past 50 years and a compilation of generalizations from the literature. Some generalization are illustrated by a case study conducted at the British Columbia Provincial Museum (BCPM) in the late 1970's. The aim was to improve the interest, attention, and learning of archeology, education, and design staffs.	theory/think piece	Exhibit/Display; attraction, attention
Bull, G S	The role of questions in maintaining attention to contextual material. Review of Educational Research, 43, 1973, 83-87.	Analysis of the Rotkopf (1970) theory of "magnetic behavior" which describes attending behaviors and give birth to learning and Frase (1968) analysis of pre- and postquestions in aiding reading.	theory/think piece	Publication; behavior
Center for Environmental Interpretation	Evaluating Interpretation. Special Issue of the Bulletin of the Center for Environmental Interpretation, July 1990, Manchester.	Includes case studies that examine how museum exhibits can change visitors' perceptions of cultures.	theory/think piece	Exhibit/Display; attitude
Christensen, H H, Dustin, D L	Reaching recreationists at different levels of moral development. Journal of Park and Recreation Administration, 7(4), Winter 1999, 72-80.	Describes framework to illustrate why interpretive messages may or may not work and suggest ways to make messages more effective using Kohlberg and Gilligan's stages of moral development.	theory/think piece	Publications; knowledge
Churchman, D	The educational impact of zoos and museums: A review of the literature. Paper presented at a Meeting of the American Psychological Association (Los Angeles, CA, August, 1985).	Education is identified as one of the major goals of zoos. Research studies of the educational goals of different audiences associated with zoos and aquaria are reviewed in this report. These audiences include: (1) the zoo staff; (2) volunteers or docents; (3) general community members in formal programs; (4) students (elementary through graduate school); and (5) recreational visitors. The report also discusses the educational components of, and factors affecting, education in zoos, emphasizes the need for visitor research, explains approaches for conducting research on human behavior learning in the zoo/museum/aquarium environment, and reviews problems associated with the commonly employed methodologies of experimental design studies and survey research.	theory/think piece	Facilities; knowledge, behavior

Author	Study	Focus	Type of Reference	Keyword(s)
Costanzo, M, Archer, D, Aronsen, E, Pettigrew, T	Energy conservation behavior: The difficult path from information to action. American Psychologist, 41(5), 1986, 521-528.	The authors discuss several methods for influencing behavior change in the context of their research on ways to improve the effectiveness of energy conserving programs. Most programs designed to increase the adoption of energy-conserving technologies have relied on large-scale information campaigns. These efforts are often based implicitly on two vague theories of conservation behavior: the attitude-change model and the rational-economic model. Although these models are clearly useful, they underestimate the complexity of influence processes and behavior change. Paper contains parallels for the planning and design of different kinds of communication methods in exhibit settings, such as information processing, cognitive processes that affect the probability that information messages will be perceived, the role of cognitive dissonance, issues of perceived credibility of the exhibit content, and the influence of the motives and beliefs of museum visitors on memory for information that visitors come across in exhibits.	theory/think piece	Exhibit/Display; behavior
Csikszentmihalyi, M	Human behavior and the science center. In: Paul Heltne & Linda Marquardt (Eds.), Science Learning in the Informal Setting, 1988, Chicago, IL: The Chicago Academy of Sciences, 80-87.	This essay deals with two questions: (1) what motivates viewers to become involved with information presented in informal settings (such as science centers and museums)? (2) what information about human behavior can be best presented in a science museum? To answer the first question, a model of intrinsic motivation is developed. The requirements for a person to enjoy the viewing experience are examined. It is argued that museums must rely on intrinsic motivation to get viewers to learn. As for the second question, a few simple principles for classifying human behavior are discussed to stimulate ideas about presenting this rich and important material to the museum audience.	theory/think piece	Facilities; behavior
Davis, J	Visitor studies in art museums: A selected annotated bibliography. Jacksonville, AL: Center for Social Design.		study review/meta analysis	
Diamond, J	Sex differences in science museums: A review. Curator, 37(1), 1997, 17-24.	This paper reviews the literature about how gender differences carry over into science museums and to what extent gender differences might be minimized. Behavioral studies indicate that girls generally engage in more cooperative behavior at exhibits and boys explore exhibits more actively on their own.	study review/meta analysis	Facilities; behavior
Dwyer, F M Jr.	Exploratory studies in the effectiveness of visual illustrations. Pennsylvania State University, Dec 1969, 26 pp. AV Communications Review 18: (3) 235-249 1970	Several studies reviewed in this article evolved from an attempt to determine the instructional effectiveness of different types of visual illustrations used to complement and to visualize oral and verbal instruction. The line drawings are most effective in the slide study; the oral presentation was most effective in the videotape study; and realistic photographs were most effective in the programmed instruction study. Results indicated that at certain grade levels, color is an important instructional variable. Where time is unlimited, simple line drawings are preferable; where time is determined by the students, as in programmed instruction, more detailed presentations have greater learning value.	study review/meta analysis	Graphics; knowledge
Ellis, J. Koran, J J Jr., Koran, M L	Visitor Learning in Museums. Curiosity and Human Development Theories: Implications for Museum Programs and Exhibit Design. Museum Studies Program. Reviews of Current Research Volume 1. 1991.	This paper reviews human development theories that could be utilized in the study of museums as well as theories or approaches to curiosity that appear to be of significant interest for museum exhibit designers and educators. An overview of each theory is followed by a general evaluation of the theory and research that appears relevant. The implications for practice as well as potential future directions for research in informal settings also are discussed.	theory/think piece	Facilities; knowledge

Author	Study	Focus	Type of Reference	Keyword(s)
Falk, J H	The use of time as a measure of visitor behavior and exhibit effectiveness. Journal of Museum Education: Roundtable Results, 7(4), 1982, 10-13.	The author discusses the allocation of time by visitors as an evaluation measure of the impact of an exhibit on satisfaction, interest, etc. The average visitor spends not much more than two hours in a museum, only about 30 minutes of which is spent attending to exhibits. Falk suggests that this mean time does not reflect the behavior of any particular group. Falk recommends that time spent by different populations must be analyzed.	theory/think piece	Facilities; behavior, time
Falk, J H, Koran J J Jr, Dierking, L D	The things of science: Assessing the learning potential of science museums. Science Education, 70(5), 1986, 503-508.	This is a review of the literature in science museums that emphasizes exhibits and the roles played by objects or "things" in affecting learning. The authors suggest that objects permit visitors to experience science in concrete "touch and feel" terms. Visitors distinguish object-oriented learning from school learning, which is more abstract ("book") learning. The authors assert that museums, via exhibits and their objects, represent one of the best devices for presenting concrete information to the public.	study review/meta analysis	Facilities, Exhibit/Display; behavior, knowledge
Franklin, R D, Gorman, B S, Beasley, T M, Allison, D B	Graphical display and visual analysis. Franklin, R D (Ed), Allison D B (Ed), et al. (1996). Design and analysis of single-case research. (pp. 119-158). Mahwah, NJ, USA: Lawrence Erlbaum Associates, Inc. xxi, 391 pp.	Review literature addressing visual inspection of graphed single-case data/explore graphics perception, considering strategies for enhancing accuracy in visual displays. Importance of integrating visual analysis with statistical analysis; interactions of stimulus properties with human information processing; identification of strategies for enhancing accuracy in visual display.	study review/meta analysis	Signs
Griggs, S A	Perceptions of traditional and new style exhibitions at the Natural History Museum, London. ILVS Review, 1(2), 1990, 78-90.	The Natural History Museum in London has been recognized for its pioneering application of visitor studies to its exhibition development process. The paper discusses the museum's approach to designing exhibitions with the aim of improving understanding of visitor exhibit interactions and with developing exhibitions which succeed in communicating with visitors. Assessing the quality of the museum experience has been based on the evidence gained from visitor surveys, visitor perceptions of exhibitions and a follow-up study on visitor perceptions of new style and traditional exhibitions. These studies and their methodologies are discussed.	theory/think piece	Exhibit/Display; preference, satisfaction
Hodgson, P	Tour operator brochure design research revisited. Journal of Travel Research, 32(1), 1993, 50-52.	This research points out that a great deal of money is spent on tourism brochures with little return in the way of bookings. In the U.K., for example, brochures result in a 90% "wastage" rate. The suggestion is made that market research is needed on the effectiveness of brochures so that the function of brochures in the vacation selection process is better understood.	theory/think piece	Publication; behavior
Kellert, S D	The educational potential of the zoo and its visitors. The Philadelphia Zoo Review, 3(1), 1986, 7-13.	Conference presentation which discusses the educational potential of zoo's in terms of zoo design, exhibit type, visitor expectations, animal conservation issues, etc.	theory/think piece	Facilities; knowledge
Knapp, M, St. John, M, Zucker, A, Shields, P, Stearns, M, Middleton, T, Shaver, D M	An approach to assessing initiatives in science education: Volumes 1 and 2. 1988. Menlo Park, CA: SRI International (Project #1809). (Vol. 1: 170 pp.; Vol. 2: 170 pp.).	Volume 1 includes approaches to assessment of science education, science exhibition design, and methodological issues. Volume 2 includes findings, guidelines, and conclusions from "feasibility" studies and pilot discussions which examine ways of assessing informal education in its various forms (TV, videocassettes, science centers, etc.).	theory/think piece	Exhibit/Display; preference

Author	Study	Focus	Type of Reference	Keyword(s)
Koran, J J, Jr, Koran, M L	The roles of attention and curiosity in museum learning. <i>Journal of Museum Education</i> , 8(2), 1983, 14-17, 24.	For an exhibit to be educationally effective, the authors point out that it must attract and maintain attention as well as provide useful information. They suggest that curiosity interacts with attention. They suggest that advance organizers (information obtained prior to a visit) can help reduce novelty of the setting, and theoretically, increase time spent attending to and learning from individual exhibits. The research reviewed in this report points to the feasibility of studying attention and learning using both experimental and naturalistic methods and the critical role of attention directing and focusing devices and pre-instruction in visitor learning in museum settings. It also highlights the interaction of curiosity with attention and the function both play in information processing.	theory/think piece	Exhibit/Display; knowledge, attention
Koran, J J, Jr., Koran, M, Foster, J	Individual differences in learning in informal settings. In: S. Bligood, J Roper, & A. Benefield (Eds.), Volume 1. Visitor studies: Theory, research, and practice (p 66-72). 1988. Jacksonville, AL: Center for Social Design.	A discussion of variables that may affect the amount of "mental effort" expended by visitors and how this effort could be influenced by manipulating visitor perceptions of an exhibit. The researchers describe a theoretical model based on the publications of Saloman (1983) and Anderson et al (1983), which suggests how visitors perceive the difficulty level of an exhibit (or label, etc.) and how this perception can affect what visitors pay attention to and what they remember.	theory/think piece	Exhibit/Display; knowledge
Koran, J J, Jr, Shafer, L	Learning science in informal settings outside the classroom. In M. B. Rowe (Ed.), <i>Education in the 80's: Science</i> . 1983. Washington, DC: National Education Association.	Discussion and review of relevant literature related to informal science learning. Article makes observations and substantiated suggestions of what can be done prior to, during, and after informal learning experiences to maximize learning.	study review/meta analysis	Facilities; knowledge
Kuehner, B	Visitor centers: What works and what doesn't. <i>The Interpreter</i> , 8(3), 1976, 6-15.	Visitor centers serve both an interpretive and public relations function. They are often the focal point for an agency's interpretive program, and they provide an excellent opportunity to educate the public about its natural and cultural environment.	help article	Facilities; preference
Kulik, J A, Kulle, C	Timing of feedback and verbal learning. <i>Review of Educational Research</i> , 58(1), 1988, 79-97.	A study of findings on feedback timing and human verbal learning involving 53 separate studies. Review of literature suggests that immediate feedback rather than delayed feedback results in the highest levels of learning. Prospective ways to elicit covert responses and providing immediate feedback in informal settings include: audio tapes, computers, video tapes, print material, etc.	theory/think piece	Audio/Visual, Computer, Publication; knowledge
Lawless, K A, Brown, S W	Multimedia learning environments: Issues of learner control and navigation. <i>Instructional Science</i> , (25)2, 1997, 117-131.	Examines how different internal learner characteristics (prior knowledge, self efficacy, and interest) and different external constraints (learner control, instructional design, and level of control) influence the learning process. Discusses learning from multimedia environments (video, hypertext, kiosk, and other hypermedia) within a schema theory framework incorporating a constructivist view. Kozma (1991) purports that learner-controlled multimedia environments challenge learners to develop and use cognitive skills in addition to those used with more traditional learning environments such as textbooks. The development of these skills is centered around one's abilities to make mindful navigational selection.	theory/think piece	Audio/Visual, Display/Exhibit, Computer; knowledge
Loomis, R J	How do we know what the visitor knows?: Learning from interpretation. <i>Journal of Interpretation Research</i> , 1(1), 1996, 39-45.	Presentation of a number of ideas about what visitors learn from interpretation.	theory/think piece	knowledge

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Maguire, M C	A review of user-interface design guidelines for public information kiosk systems. International Journal of Human-Computer Studies, 50(3), Mar 1999, 263-286.	Reviews general guidelines on user-interface design for self-service and public information kiosk systems, based on the author's research and on existing literature. The guidelines cover such topics as: defining user requirements, location and encouraging use, physical access, introduction and instructions, language selection, privacy, help, input, output, structure and navigation, and customization. The paper also emphasizes the need to design for stakeholders other than the end users, and offers some guidelines on user-based evaluation of kiosk systems.	theory/think piece	Display/Exhibit
Malone, T W	Toward a theory of intrinsically motivating instruction. Cognitive Science, 4, 1981, 333-369.	This presents research data on the conditions that make some computer games interesting and others uninteresting, and how these features apply to any instructional system, including self-directed learning. The three important elements of Malone's theory consist of: challenge, fantasy, curiosity. The paper also includes guidelines that could be used in the design, not only of high interest instructional computer games, but also other instructional situations (such as museum exhibits).	help article	Computer; preference
Melton, A W	Visitor behavior in museums: Some early research in environmental design. Human Factors, 1972, 14(5), 393-403.	Two parts: 1st) Edited portion of the summary chapter of the monograph Melton wrote to describe experiments at the Pennsylvania Museum of Art in Philadelphia 2nd) Shortened version of an article Melton wrote about studies at the Museum of Science and Industry in New York City.	theory/think piece	Facilities; behavior
Miles, R S	Lessons in "Human Biology": Testing a theory of exhibition design. International Journal of Museum Management and Curatorship, 5(5), 1986, 227-240.	The application of a theory of exhibition design to the Hall of Human Biology is described. The 11 working assumptions from the initial plans for the exhibition are listed and the validity of these assumptions were then evaluated after 10 years of use and improvements. This paper is full of real-world examples of the revision of procedures applied to several of the exhibit assemblies. It concludes with a review of the 11 original assumptions and a list of 8 major lessons that were learned about the planning and design of exhibits when one attempts to integrate subject matter, visitor needs, and educational design principles into an overall exhibition design.	theory/think piece	Exhibit/Display; preference
Miles, R S, Tout, A	Holding power: To choose time is to save time. ASTC Newsletter (What Research Says Series, #15.), 19(3), 1991, 7-9.	This is a summary of classic studies on holding power from E. Robinson, A. Melton, and others, and what they tell us about the behavior of the average museum visitor, how we should design exhibits to achieve greater impact.	study review/meta analysis	Exhibit/Display; time
Morrissey, K, Berge, A	Exploring the relationship between media and learning: Lessons from the field of educational technology. In: A. Benefield, S. Biggood, & H. Shettel (Eds.), Volume 4. Visitor studies: Theory, research, and practice (p178-194). 1992. Jacksonville, AL: Center for Social Design.	This is a summary of research on relationships between learning from interpretive media and individual's beliefs and attributions about media. Learner perceptions toward media appear to depend on whether a task is viewed as easy or difficult and often choose media that appears fun and easiest to use although they will learn least from, or to activities inappropriate for the learning task.	study review/meta analysis	Publication; knowledge
Rabb, G B	The unicorn experiment. Curator, 12(4), 1969, 257-262.	A field study of the effectiveness of traditional (scientific names) and nontraditional (common language) wording of label heading and text on stops and the reading of label signs. Attention span is doubled by a good sign. Signs in the shade are more likely to be read than those in the sun (in the summer). The author concludes that in the development of labels for the general public requires careful attention needs to be given (a) to content, vocabulary, length, color, placement, typographical format, and every other aspect, and (b) to evaluating their effectiveness to make improvements when needed.	theory/think piece	Sign; attention

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Robinson, E S	Experimental education in the museum: A perspective. Museum News, 10(16), 1933, 6-8.	The author attempts to show that there is a need for evaluation of all phases of museum activity.	theory/think piece	Facilities; preference
Screven, C G	The measurement and facilitation of learning in museum environment: An experimental analysis. 1974. Washington, DC: Smithsonian Press.	The main portion of this book focuses on several research studies on the motivation and shaping of unguided visitor attention and learning at several exhibitions in the Milwaukee Public Museum.	study review/meta analysis	Facilities; attention; knowledge
Screven, C G	Motivating visitors to read labels. ILVS Review: A Journal of Visitor Behavior, 2(2), 1992, 183-211.	This paper examines key functions of Interpretive labels/graphics that relate to the informal conditions in museums under which labels must perform. It examines the poor results often seen when label designs do not meet the limitations, needs, and expectations of unguided museum audiences. Methods for improving the quality of the attention visitors give to labels and the steps exhibit teams can follow in preparing the pretesting labels are presented.		
Serrell, B	The evolution of educational graphics in zoos. Environment and Behavior, 20(4), 1988, 396-415.	Both the style and content of zoo graphics have evolved over the years to reflect changes in thought about what zoos should communicate to their visitors and changes in the perception of visitors' behavior. Modern graphics communicate the agenda of zoos within a broad social context and are more conducive to experiential learning. The evaluation of zoo signage has focused typically on the efficacy of a sign in communicating a direction or thought. Future evaluation needs to consider the nature of the visitors' interactive experiences within the zoo setting and implement these findings in graphic designs.	help article	Signs; attention
Shettel, H H	An evaluation of existing criteria for judging the quality of science exhibits. Curator, 11(2), 1968, 137-153.	This paper addresses two questions: (1) What are the characteristics of effective exhibits as reflected in the exhibit literature? (2) Is there agreement on the extent of their implementation within a particular exhibit? The author identifies 47 publications that addressed one or more criteria of exhibit effectiveness. From 350 related statements, 15 categories were developed related to effectiveness. These categories produced a 74-item rating scale for judging the "quality" of a particular exhibit. Twenty five exhibit designers, museum managers, and curators used this scale to rate up to a maximum of seven different science exhibits. Results revealed that inter-rater reliability was quite low. The author concludes by noting that any real improvements in the effectiveness of exhibits must be supported by objective evaluation studies based on clearly defined exhibit outcomes and demonstrated visitor behaviors, rather than on the kinds of subjective and unreliable "expertise" often reflected in much of the exhibit literature.	study review/meta analysis	Exhibit/Display; behavior
Spencer, K	Modes, media and methods: The search for education effectiveness. British Journal of Educational Technology, 22(1), 1991, 12-22.	The educational effectiveness of illustrations, visual-based instructional media, programmed learning, computer assisted learning, audio-tutorial instruction, organization of groups, and mastery learning strategies are discussed. It is suggested that this research, which clearly indicates a variety of ways in which levels of educationally significant improvements can be greatly enhanced is being ignored in new curriculum developments.	theory/think piece	Audio/Visual, Computer; knowledge
Stansfield, G	Effective Interpretive exhibitions. 1981. Department of Museum Studies, University of Leicester. Cheltenham, England: Countryside Commission.	Commissioned to provide guidance in the planning and design of interpretive exhibitions, this study involves a review of 175 references, including monographs, theses, and periodical articles, reporting research into the effectiveness of interpretation related to the printed word. Using the literature, the author synthesizes factors which have a bearing on the communication effectiveness of exhibits, which include extensive quotes from the original literature. Major topics include: the formulation of objectives, analyzing the resource, the selection of media, building, exhibitions, the written word, and evaluation of interpretive materials. There is an extensive bibliography.	study review/meta analysis	Exhibit/Display, Publication

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Tennor, E	Signage and graphics in public recreation and park facilities. Signage and Graphics, Winter 1997, 8-15.	Signs and graphics serve to promote and enhance park image, direct the way, improve safety and enrich the park experience for visitors.	theory/think piece	Signs, Graphics; satisfaction
USDA Department of the Interior, National Park Service	Proceedings of the conference on social research in national parks and wildland areas, Gallinburg, Tennessee, March 21-22, 1980.	The papers are arranged in two sections: Part I consists of ten examples of current visitor studies. They range from basic concerns with identifying visitor use patterns to measurements of visitor perceptions of area conditions to studies aimed at sorting out dimensions of conflict situations. Part II includes five papers that aim at improving the conceptual base for social research in wildlands followed by papers which compare studies and develops an integrating framework for understanding how social research fits into complex aspects of campground development and rehabilitation. Papers are abstracted separately and are indexed under USA, Department of the Interior, National Park Service in the author index.	study review/meta analysis	Facilities; use, preference
Wegar, J A	Evaluating the effectiveness of interpretation. Journal of Interpretation, 1(1), Summer 1976, 1-8	The author discusses the importance of evaluating the effectiveness of interpretation. He discusses the objectives, obstacles, and a variety of evaluation techniques.	theory/think piece	Evaluation
Wegar, J A	Effectiveness in Interpretation. The Interpreter, 7(3), 1972, 6-15.	According to this author, interpretation has meaning only in terms of the effects it creates within an audience. The author discusses clear objectives, audience attention, and appropriate evaluation as necessary components of effective interpretation.	theory/think piece	Evaluation
Wegar, J. A., Lovelady, G. W., Falkin, H.	Evaluation techniques for interpretation: Study results from an exhibition on energy. 1976. Portland, OR: Pacific Northwest Forest and Range Experiment Station. USDA Forest Service Research Paper PNW-211.	The Pacific Science Center's 1973 summer exhibition, "Energy and its Relation to Man and the Environment," was studied to determine the effectiveness of evaluation techniques. Six techniques were tested--opinion from panel of selected outsiders; volunteered comments; observed audience attention; time-lapse photography; visitor voting at individual presentations; following sample visitors.	theory/think piece	Exhibit/Display; preference, attention



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