

FACTORS THAT ENHANCE EFFECTIVENESS OF VISITOR MAPS

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ABSTRACT: The focus of the series of studies reported here is on the effectiveness of handout maps as wayfinding aids for museum visitors, and on the importance of wayfinding to the quality of museum visitors' experiences. The design of the handout maps that were used in the studies was guided by a series of cognitively based principles that focus on the concept of simplicity. More than 700 visitors participated in these studies, which involved both surveys and performance measures. The results show that visitors are eager to use handout maps and find them helpful even when they contain few details. Furthermore, 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.

This article presents an analysis of the design and function of handout maps in an art museum. But it is also a tale of the interplay among theory, research, and practice. The series of

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studies discussed here and the articulation of the theoretical framework that guided the effort were occurring simultaneously with the urgent efforts of a particular museum to provide improved handout maps for its visitors. As a result, time pressures and the immediate needs of the museum staff meant that the flow from theory to research to application did not follow a systematic progression. Nonetheless, the museum staff was eager to produce an effective handout map for visitors and was supportive of research to guide the process.

Ideally, in a real-life situation such as this, one would turn to the empirical literature for guidelines. The effectiveness of signs and "you-are-here" maps has received some research attention (as summarized by Carpman, Grant, & Simmons, 1986). Much of the research on wayfinding, however, has been in the context of large-scale exterior settings (Bitgood & Richardson, 1987; Hayward & Brydon-Miller, 1984; Serrell & Jennings, 1985). Even when interior settings have been examined, this has typically been in the context of broad-based efforts to improve wayfinding by making numerous changes in signage, in both posted and hand-held maps, and possibly even in the physical layout of the setting (Cohen, Winkel, Olsen, & Wheeler, 1977; Howes, 1990; Loomis, 1987). Consultants do much of the work in this area, and their reports are often not available in refereed journals. For these and other reasons, there is little published research that explores factors that impact the effectiveness of portable or hand-held maps. Yet such handout maps are, in fact, widely used in museums and have been shown to be effective in providing orientation information to visitors (Hayward & Brydon-Miller, 1984).

The existing literature thus provided at best limited guidance concerning how to construct a more effective handout map for

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museum visitors. Arthur and Passini (1992) suggest that maps of interior areas can be more abstract or stylized than maps of exterior spaces. This suggestion is useful, as is the recommendation by them and by Loomis (1987) that maps should be simple. In terms of translating these suggestions into practical guidance for those attempting to develop an effective handout map, however, they leave much unsaid.

In reviewing both the handout map which the museum had been using and the floor plans of numerous other museums, we found ourselves applying theories developed in more abstract contexts. Such maps frequently seemed to violate principles of human cognition. Visitor maps are characteristically a rich source of information, but the very richness often gets in the way of communicating the basic intent of the map. The museum staff had no difficulty reading these maps and may have felt that using this opportunity to provide the viewer with a sampling of the museum's collections was essential. From a theoretical perspective, however, we suspected that the cognitive differences between the staff and the novice visitor to the museum would be reflected in different reactions to such maps, and that visitors would not find information-rich maps nearly as useful.

THEORETICAL FRAMEWORK

Our approach to this project was thus guided by three basic assumptions:

1. Wayfinding is a challenging and nontrivial concern of the museum visitor that impacts many other aspects of the visitor's experience.
2. A visitor map can be a significant aid to wayfinding, but in order to do so, it must be simple.
3. There are systematic and important differences between experts and novices. The museum staff, being experts, would have different needs and perceptions than most visitors.

Given these theoretically based assumptions, our first step was to explore what the less experienced visitor would require

in a handout map. It may be instructive to begin this discussion with a brief analysis of the cognitive functioning of the expert, because ideally one would like to be able to help novice visitors to function in a somewhat more expert fashion, feeling comfortable and capable of finding their way around the museum setting.

The expert's perceptual power in seeing and understanding a familiar environment is the result of an extensive process of progressive simplification (Kaplan, 1977; Kaplan, Gruppen, Leventhal, & Board, 1989). When one encounters something for the first time, the cognitive reaction can readily take up all the room in one's head. By contrast, as familiarity increases, the way it is represented in one's head becomes far simpler and more compact (Kaplan & Kaplan, 1982). In fact, it eventually becomes represented so efficiently that one has the mental room left over to experience other things as well.

There are three profound advantages to this simplification process: (a) One can take in more without being overwhelmed; (b) one can achieve a hierarchical perspective, or see the bigger picture; and (c) one can make transformations of the material, or manipulate it, to meet a variety of needs.

Unfortunately the novice does not enjoy these advantages. Lacking the powerful simplification the expert has achieved through a wealth of experience, the novice is readily overwhelmed, rarely gets the bigger picture, and finds it difficult to make any transformations (for example, correctly realigning a map to correspond to the direction one is physically facing; Levine, 1982; Levine, Marchon, & Hanley, 1984).

GUIDING PRINCIPLES

The theoretically grounded principles underlying this research on handout maps were thus focused on the essential role of simplicity. For this specific application, the following extensions of the general theory guided our effort.

1. The novice visitor in particular is readily overwhelmed by large amounts of information. Thus one vital aspect of simplicity involves

minimizing the amount of information and the degree of detail. Reducing detail often requires a sacrifice of literalness and accuracy, which may be difficult for an expert to accept.

2. Immediate comprehension is critical. Ease and directness of use constitute a different kind of simplicity, namely a concern to minimize the mental processing required to understand the map. For example, the spatial juxtaposition of information facilitates comprehension. On the other hand, finding a key or legend, remembering what the connection was, and then returning to the previous place on the map require considerable cognitive overhead. Similarly, complex or unhelpful nomenclature adds a cognitive burden. When names have no relationship to functions, or when the terms used are not common knowledge, the immediacy of information is diminished.
3. The map needs to facilitate comprehension of spatial relationships. The most basic information should be the most distinctive and easiest to find. It is also helpful to indicate the different regions of the setting. Providing such a hierarchical perspective is a great aid to orientation and understanding. Being able to obtain an overview, a global sense for the space associated with different activities, is tremendously helpful to the visitor.

These principles can be summarized by saying that the eye and brain of the visitor, even the novice visitor, can be a powerful system for obtaining useful information about an unfamiliar environment from a carefully constructed handout map. For this to happen, however, the map must present the kind of configuration that is compatible with the needs and limitations of the visitor. Unfortunately, as for so many well-intentioned efforts at information transfer, the eye and brain of the expert are so radically different from those of the visitor that direct translation is not possible.

THE STUDIES

This research was conducted in two major phases, involving five different handout maps and over 700 participants. Separate studies were conducted within each of the two research phases to examine participants' first impressions of the handout maps, as well as visitors' reactions after using the handout maps for wayfinding purposes.

The maps used in the studies were developed in collaboration with the museum staff and generally followed the guiding principles. The realities of the collaborative arrangement precluded a strict, hypothesis-driven approach to the studies. The studies thus do not constitute systematic tests of the principles. Rather they shed considerable light on the functions that handout maps can and do serve and help one understand in a more concrete sense just how simple the information in a handout map needs to be to function effectively.

All the studies were carried out at the Toledo Museum of Art, considered one of the country's excellent moderate-sized museums. Like many older museums, the two-story facility has undergone several changes. From a wayfinding perspective, one particularly significant change relates to the building's primary entrance. Rather than climbing the grand stairs from the sidewalk and entering the original lobby on the upper level, most visitors park near what had been the back door and enter the museum through a smaller modern lobby on the lower level. Visitors then pass a dining area, shops, restrooms, and a few galleries before reaching the central stairway. From the top of the stairway, visitors can turn to the right or left to view the main galleries. In addition to the museum, the building also includes a theater wing, which can be entered from either floor, and a separate classroom area on the lower floor.

MAP DEVELOPMENT

Considerable interaction with the museum's curatorial and administrative staff occurred throughout the development of the handout maps that were used in the studies. Issues addressed during these sessions included the placement of legends, the amount of detail, lettering size and style, the inclusion of gallery numbers, how to label galleries, and whether a donor's name should be included as part of the lobby label. Three maps, each showing only the upper floor of the museum, were developed for Phase 1, which involved both a survey and a study in which visitors used one of the maps to complete specific tasks (see Table 1 for

TABLE 1
Summary of Handout Map Studies

<i>Participants</i>	<i>Maps Used and Variations</i>	<i>Study Instructions</i>
Phase 1, Study 1: Entry Survey 24 information desk volunteers 13 security staff 103 visitors	Upper floor only, few details; B&W photocopy, simple labels. Three versions: 1) upper lobby, or 2) parking lot at bottom of map; 3) "thick" walls outlining regions	Rate maps, mark to show where you are, are you likely to use a map for wayfinding
Phase 1, Study 2: Map Tasks 45 visitors	Same as Phase 1, Study 1	Pick a map; 1) use it, later report how well it worked out; or 2) mark where you are, point which way you would walk to reach labeled areas, draw route to parking lot
Phase 2, Study 1: Entry Survey 117 visitors (24 pretest visitors)	Both floors of museum, sim- ple gallery labels. Versions: 1) 4-color official museum map, some general infor- mation; 2) B&W photocopy with brackets and labels to identify regions	Rate maps, indicate con- cerns and expectations of the visit
Phase 2, Study 2: Exit Survey 374 visitors (29 pretest visitors)	Same as Phase 2, Study 1	Rate map, indicate why you came, wayfinding difficul- ties, what you used for wayfinding, your satis- faction with visit

details of all the studies). Phase 1 included 148 visitors, as well as some security staff and volunteer workers.

In consultation with museum staff, the research group then developed a more complete handout map, showing both floors of the museum, to use as the basis for Phase 2. This phase

included separate surveys of incoming and exiting visitors and had over 500 participants. Meanwhile, the museum staff was developing a new official handout map to make available to all museum visitors. Unbeknownst to the research group, the map adopted by the museum incorporated many characteristics of the research map that was simultaneously being prepared for the final studies. As a result, the differences between the two maps (the research map and the new official map) that formed the basis for comparison in Phase 2, are relatively small. These two maps did differ substantially in visual quality—the official version is in four colors on glossy paper whereas the research version is a black and white photocopy. A further difference between these maps involves regional identification (brackets indicating major portions of each floor), which was included only in the research version (Figure 1).

Although five different handout maps were used in the various studies, they all had some features in common. Shading was used to communicate that a common theme (e.g., historical period) linked the works in adjacent galleries. Furthermore, maps that were directly compared within a study (e.g., the three research maps used in Phase 1) were of the same size and used identical labels to identify the collections (see Kaplan, Kaplan, Talbot, & Kuo, 1992, for further details on the studies).

PARTICIPANTS

All of the studies included museum visitors as participants. Individuals were approached by research staff or by specially trained museum volunteers and asked whether they would be willing to participate in a study carried out collaboratively by the museum and the study team. Visitors were generally very cooperative and willing to participate in these studies. The few who declined did so because of time constraints or the logistics of managing young children. Survey times were varied, including both weekends and weekdays, morning and afternoon periods. Both research staff and volunteers followed standard survey and interview protocols that were prepared by the research team.

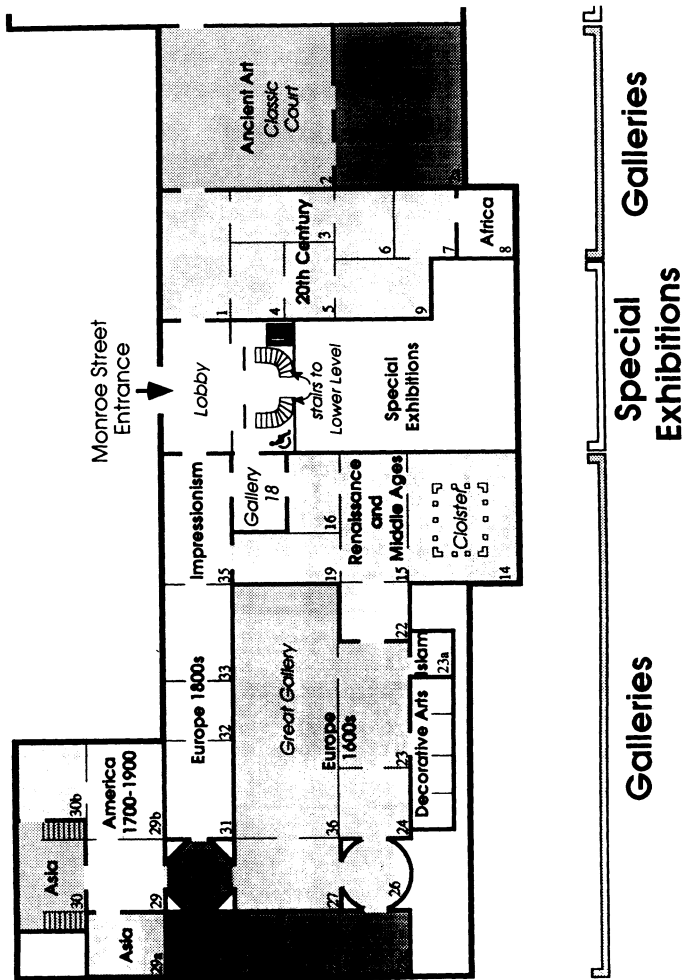


Figure 1: Portion of Research Version of the Upper Level Handout Map Used in Phase 2

NOTE: Placement of legends, thematic shading, schematic presentation, and brackets indicating higher level organization.

The first study in Phase 1 also included volunteers who worked at the museum information desk and security workers. The volunteers completed the survey during their regular monthly meeting, and security workers completed the survey at the end of their workday. These individuals have considerable experience with museum visitors' wayfinding difficulties and were asked to reflect visitors' needs in their responses to the survey.

MEASUREMENT AND PROCEDURES

Both Phase 1 and Phase 2 included surveys in which visitors were asked to give their first impressions of a handout map before exploring the museum. Phase 2 also included a study in which exiting visitors completed surveys asking for their reactions to the map they had used during their visit. Each participant was involved in only one study (i.e., there were no pre-post comparisons in which an individual completed both an entry and an exit survey). Participants in all of the studies were asked to suggest ways to improve the map and to comment on their museum visit in general.

For the studies in which survey instruments were used, 5-point scales were used to gain responses to short items; these always used the highest scale value to designate the highest rating (e.g., 5 = *a great deal*). Phase 1 also included a study that focused on task performance. Visitors participating in this study were asked to perform activities such as locating specific destinations or drawing a route to the parking lot on the handout map.

Procedures for distributing the handout maps varied. In the Phase 1 entry survey, participants were randomly given one of the three versions of the single-floor handout map, which was stapled to the printed survey. For the Phase 1 map tasks, participants each looked briefly at two of the maps and then selected whichever version they found more appealing to use for the study. In Phase 2, incoming visitors completed the entry survey after looking briefly at whichever version of the handout map they had just received. On days when the Phase 2 exit

survey was being conducted, either the research map or the new official museum map was made available to all visitors when they entered the museum, and the survey form included a space for recording which version of the map, if any, the participant had used.

RESULTS AND DISCUSSION

These studies were designed to explore the role of handout maps in contributing to museum visitors' experiences in general and to see how the theoretical issues discussed in the introduction could be effectively applied to the design of a handout map for visitors.

SIMPLICITY

The researchers' conviction that the handout map would be improved by simplifying it was not initially shared by the museum staff. This concern for simplicity affected the amount of information and its placement in the different versions of the handout map and the level of detail used in portraying the space and in labeling the collections.

The handout map used by the museum at the start of the project was a four-page brochure with the two inside pages devoted to floor plans. The researchers proposed redesigning the handout map to serve only as a wayfinding aid, omitting most of the text, and suggested that separate, souvenir-quality brochures could be available for visitors interested in the museum's history and its collections (cf. Howes, 1990, who found that visitors never unfolded their brochure to find out that the museum contained a lower level, and Serrell & Jennings, 1985, who report that exiting visitors never realized that the brochure they had received upon entering a zoo contained a map of the grounds). Although staff felt that the existing handout map needed improvement, they expected the researchers to accomplish this by suggesting how best to incorporate additional detail, rather than by reducing its amount.

After considerable discussion between the museum staff and the researchers, it was agreed that asking visitors to react to an extremely simplified map showing only one floor of the museum would be an acceptable way of exploring the issue of simplicity. Staff approved the simplified labels that were used in identifying different groups of galleries in the three maps that were prepared for the first research phase, and agreed that several nonessential architectural details could be omitted for testing purposes. Office names were dropped, and labels for areas were placed directly on those spaces rather than in a separate list on the side. Some detail was given, however. The floor plans did identify a few distinct museum spaces (e.g., the Cloister, Classic Court, and Great Gallery) which were perceived by visitors as being particularly important, according to the results of an earlier survey (Talbot, 1992).

One survey and one study asking visitors to use the map for specific tasks were completed in Phase 1, using three slightly different versions of this test map. Reactions to all of these simplified maps were strikingly positive. Participants commented that the handout maps seemed "very clear" and compared them favorably with the existing official floor plan. Participants were asked to suggest changes or additions, but very few additions were suggested, and the suggestions that were made did not reflect any commonly perceived landmarks. In fact, some participants said that the lack of detail was an advantage: "as [it] is is best, it gets confusing if there is more." This finding was particularly instructive. Museum staff had been especially interested in the idea of adding symbols indicating the locations of a few noteworthy works of art. The absence of any clear suggestions from the museum visitors led to the abandonment of these plans. Apparently identifying the few commonly recognized museum spaces provided sufficient landmarks for the visitors.

Responses to survey items also support the conclusion that simple maps work well for visitors. Using a 5-point scale (5 = *very much*) participants rated the maps as being "interesting," "understandable," and "informative" (means in each study between 3.7 and 4.0) and as being not at all "confusing," "overwhelming," or "hard to follow" (means 1.5—1.7). Participants

also felt the test maps gave a good sense of where things were in the museum and felt that they could easily find most places that were identified on the handout maps (means between 4.1 and 4.4). Only two problem areas were evident: finding the stairs and the exit. Ratings for these items (both means 3.3) indicated that they were somewhat harder to find than other features that were identified on the floor plans. (By contrast, participants' responses to places that were not identified on the map confirmed that they would indeed find these difficult to locate.)

The findings from the performance tasks also supported the need for simplicity and clearly illustrated the confusion that can be caused by unnecessary detail. When visitors were asked to trace a route showing how they would get to the parking lot exit, the most frequent mistake (made by about one third of the participants) was walking through emergency doors, which were indicated by a thin line spanning a doorway. Museum staff had felt that although these doors would never be open, they should be included for the sake of accuracy.

The findings from Phase 2, including comparisons between ratings given to the impressive, official four-color floor plan and the slightly simpler black and white photocopy version, were also very informative. Despite obvious differences in attractiveness, the two simplified handout maps received ratings which were very similar (no statistically different responses) and very positive. Almost all incoming visitors (95%) said they could figure out where they were on their handout map (whichever version they had randomly received) and considered the handout map very helpful in giving them a general understanding of the museum. As in the initial research phase, very few participants suggested any additions to the handout maps.

REGIONAL INFORMATION: CONVEYING AN OVERVIEW

A second issue that was explored in both phases of the research was how to give a sense for the different regions and thus to convey a sense for the overall organization of the museum. In one version of the early test map showing only the upper floor of the museum, thick walls were used to outline

different groups of galleries, as well as the special exhibition area and the lobby.

This attempt yielded inconsistent results. There were some indications that visitors reacted more favorably to the "thick-wall" map than they did to the other test versions: a few of the survey ratings were slightly more positive, and visitors were slightly more likely to select this version when given a choice of handout maps to use for the performance tasks. However, visitors also made more mistakes when using this version. When asked to trace a route through the museum, roughly 20% of the participants walked "inside" the thick walls, mistaking them for corridors. (Similar problems with maps in which different groups of galleries were outlined in red were reported by Howes, 1990.)

To avoid this confusion, regional information was conveyed differently when the research map showing both levels of the museum was developed for the final research phase. Brackets and labels at the bottom of each page identified the regions contained on each floor: Galleries, Special Exhibitions, and Theater on the upper floor; and Museum School, Museum Shops & Services, and Theater on the lower floor (see Figure 1). No visitor confusion was evident in response to this display technique.

FLOOR PLANS AND WAYFINDING

The importance of a good handout map to visitors is reflected in the participants' reactions to a number of survey questions asking how they would typically go about finding things in any museum. Participants indicated that they were quite likely to use a handout map (mean 4.2) and less likely to just trust their own sense of direction (mean 3.0). The participants were virtually unanimous (96%) in the opinion that maps are easy to read.

These results indicate that visitors are generally inclined to use handout maps for wayfinding purposes. In the Phase 2 entry survey asking about visitors' expectations of the museum visit, 92% indicated that they would be likely to use the particular handout map that had been given to them (on a random basis)

during their visit. When asked if looking at the handout map increased, decreased, or did not affect their expectations of the visit, many incoming visitors indicated that it enhanced their expectations. Forty-one percent said they looked forward more to the visit; 45% felt more comfortable, and 50% said they felt more oriented than they had felt before looking at the handout map. Twenty-eight percent indicated that they were more interested in seeing the museum as a result of examining the handout map upon arrival.

In the Phase 2 exit survey, visitors were asked if they had actually used the handout map during their visit. Despite the fact that 77% of this sample indicated that they were at least somewhat familiar with the museum, a majority (58%) reported having used the handout map. Participants also indicated that they could easily use the floor plan to tell someone else how to find specific places in the museum (mean 3.9).

This same survey also compared exiting visitors' use of handout maps with their use of signs, posted maps, and requests for museum staff assistance. These self-report results indicated that handout maps were the dominant wayfinding aid. Exiting visitors indicated having used their handout maps about three times more often than any of the other wayfinding aids examined. (Bitgood & Richardson, 1987, found a similar preference for hand-held maps over other sources of information among zoo visitors.)

HANDOUT MAPS AND VISITOR SATISFACTIONS

This research project was initiated because of the conviction on the part of a number of museum staff members that museum visitors would benefit from having an effective handout map. The data reviewed here suggest that this is, indeed, the case. Visitors with access to either of the simplified handout maps used in the final research phase reported that they had been able to find whatever they were looking for in the museum and had minimal problems with wayfinding. Both of these measures affected another critical visitor outcome: how satisfied the participants were with their visit.

The visit satisfaction item received positive responses from all visitors (mean 4.5). However, visitors who reported finding things more easily ($t = 6.72$, $df = 187$, $p < .001$) and those who reported less difficulty than others in finding their way around ($t = 2.64$, $df = 153$, $p < .01$) gave even higher ratings to the satisfaction item than did the rest of the sample.

The data from the Phase 2 entry survey also show the special value of the simplified handout maps in enhancing expectations among those who felt especially uneasy about their visit. Over half of the participants in this survey indicated that they were at least somewhat concerned about "how to visit the museum properly" or felt in need of some additional guidance material. For these visitors, looking at the handout map was especially effective in increasing their interest in seeing the museum and in increasing the degree to which they looked forward to their visit (chi-square = 11.11 and 8.25, $df = 1$, $p < .005$, respectively).

CONCLUSIONS

The results of these studies clearly validate the premise that museum visitors need effective handout maps. Visitors are eager to use handout maps, and many incoming visitors reported that seeing either of the new, simplified handout maps enhanced their expectations of the visit. The results of these studies also suggest that, besides being unnecessary, including too much detail in handout maps can cause confusion and wayfinding problems among visitors.

These data also indicate that visitors who have effective handout maps and who experience fewer wayfinding difficulties are likely to have more satisfying museum experiences. Research in different settings has suggested that wayfinding affects individual functioning in a variety of ways. The current results show the relevance of these issues in the museum setting. Wayfinding difficulties do occur in museums and clearly affect the quality of the individual's experience.

We approached this research with three assumptions. The first, that wayfinding is a significant factor in the quality of the

museum experience, was clearly supported. The second assumption, that simplicity is essential to an effective handout map for visitors, was also supported. And finally, we only have anecdotal evidence for our contention that the experts on the museum staff viewed wayfinding issues quite differently from the inexperienced visitors. Although there was no direct comparison of simple versus complex maps, the participants' enthusiasm for the two highly simplified maps that were used in the final research phase was quite striking. The staff's initiative in quickly adopting the simplified presentation that was tested in Phase 1 was a surprise to the researchers. This response demonstrates the museum staff's capacity to respond sensitively to visitors' needs for simplicity, even though staff had not anticipated these needs when the research project began.

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