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A POST-OCCUPANCY EVALUATION OF WAYFINDING IN A PEDIATRIC HOSPITAL: RESEARCH FINDINGS AND IMPLICATIONS FOR INSTRUCTION

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A post-occupancy evaluation (POE) of wayfinding in a new pediatric hospital pointed to a wide range of areas where wayfinding aids could be improved. After initial walk-through evaluation tours and meetings with administrators, five more systematic methods were used to assess problems: staff and visitor interviews, staff-maintained logs to record visitor requests for wayfinding, photographed traces in problem areas, behavior observation and tracking of visitors, and cognitive maps drawn by patients and parents. From the larger report of findings and recommendations, a few results are highlighted: a general assessment of wayfinding processes and problems, the importance of distinguishing inpatient and outpatient areas, the problems of radial floor layouts, and general problems with signs, colors, and other wayfinding cues. Results underscore the importance of triangulation — relying on multiple research methods to assess wayfinding. Issues relating to conducting post-occupancy analyses as class projects are also addressed.

INTRODUCTION

Hospitals are increasingly recognizing how difficult it can be for visitors to find their way around the facility, and they are increasingly interested in accommodating the needs of visitors. In this spirit, a post-occupancy evaluation (POE) of the wayfinding system in a one-year-old pediatric hospital was conducted to define problem areas and to suggest solutions. Multiple aspects of the wayfinding system — the signs, maps, terms, site, and layout — were investigated as part of an environmental assessment seminar research project.

Post-occupancy evaluations have been useful in a wide variety of settings (Sanoff, 1992; Wener, 1988; Zimring, 1987) and are especially important for hospitals, given their increasingly competitive financial environments and reliance on the good will of the community (Shumaker and Pequegnat, 1989). Hospital users often have no previous familiarity with the setting, so wayfinding aids oriented to the new user are particularly important. Furthermore, it could be argued that wayfinding may be more difficult for hospital visitors than for those visiting other unfamiliar buildings because the stress occasioned by the hospitalization event may already reduce visitors' information processing abilities (Cohen, 1978).

In addition to the above personal qualities that prime hospital visitors for wayfinding difficulties, the building design and characteristics of hospitals often add additional sources of problems. For example, many hospitals tend to be large, with incremental and uncoordinated growth patterns, environmental characteristics that often create wayfinding difficulties (Carpman *et al.*, 1986). In addition, signs or other wayfinding aids may be insufficient, overly technical, or inconsistent (Carpman *et al.*, 1986).

The present study examined the multiple sources of wayfinding information, both separately and together as a system, that have been suggested by previous research. In terms of specific environmental aids to wayfinding, research has underscored the importance of simplified floor layouts in general (Weisman, 1981; O'Neill, 1991a, 1991b), the particular simplicity of travel corridors that intersect at 90 degree angles (Montello, 1991), and the proper orientation (Levine, Marchon, and Hanley, 1984) and terminology (Carpman *et al.*, 1986) of visual aids. Research has also shown that wayfinding difficulties are often pervasive, beginning outside the building with the search for the correct parking areas and spaces and continuing through to the search for the correct room (Shumaker and Reizenstein, 1982). Consequently, the study examined the wayfinding journey from the parking lots to specific destinations inside the hospital.

The management of the present pediatric facility planned to incorporate results in a more comprehensive facility wide POE. Prior to the study, the hospital was perceived by management as having fairly good interior wayfinding. However, a preliminary walk-through evaluation revealed inconsistent terminology on the signs, signs that were difficult to locate, and intersections that deviated from simple 90 degree angles. This initial assessment guided the development of later systematic research methodology and substance.

In contrast, management and the research team agreed that the exterior was likely to prove more confusing. The pediatric hospital was adjacent to a larger research and teaching hospital that sprawled to the south and east of the new facility (see Figure 1). Drivers approaching from the south had to pass the larger adjacent facility and a large number of directional signs; drivers approaching from the north had to pass directional signs indicating both facilities. Consequently, the information processing demands and therefore potential for confusion outside the facility was high.

Consultation with a hospital administrator also revealed that hospital designs might not have caught up with the changing role of hospital outpatient facilities in the United States. He observed how hospitals were shifting from "front door" inpatient treatment to an ever-growing "back-door" outpatient clientele. Because outpatient treatment initially was a small part of operations at many hospitals, grand and impressive entryways have traditionally been saved for the inpatient entrances. The present hospital follows that tradition. As shown in Figure 2, the inpatient (north) entrance is the most salient. The entrance to the parking area is larger, more visible from the road, with larger signs. Between the parking lot and entrance

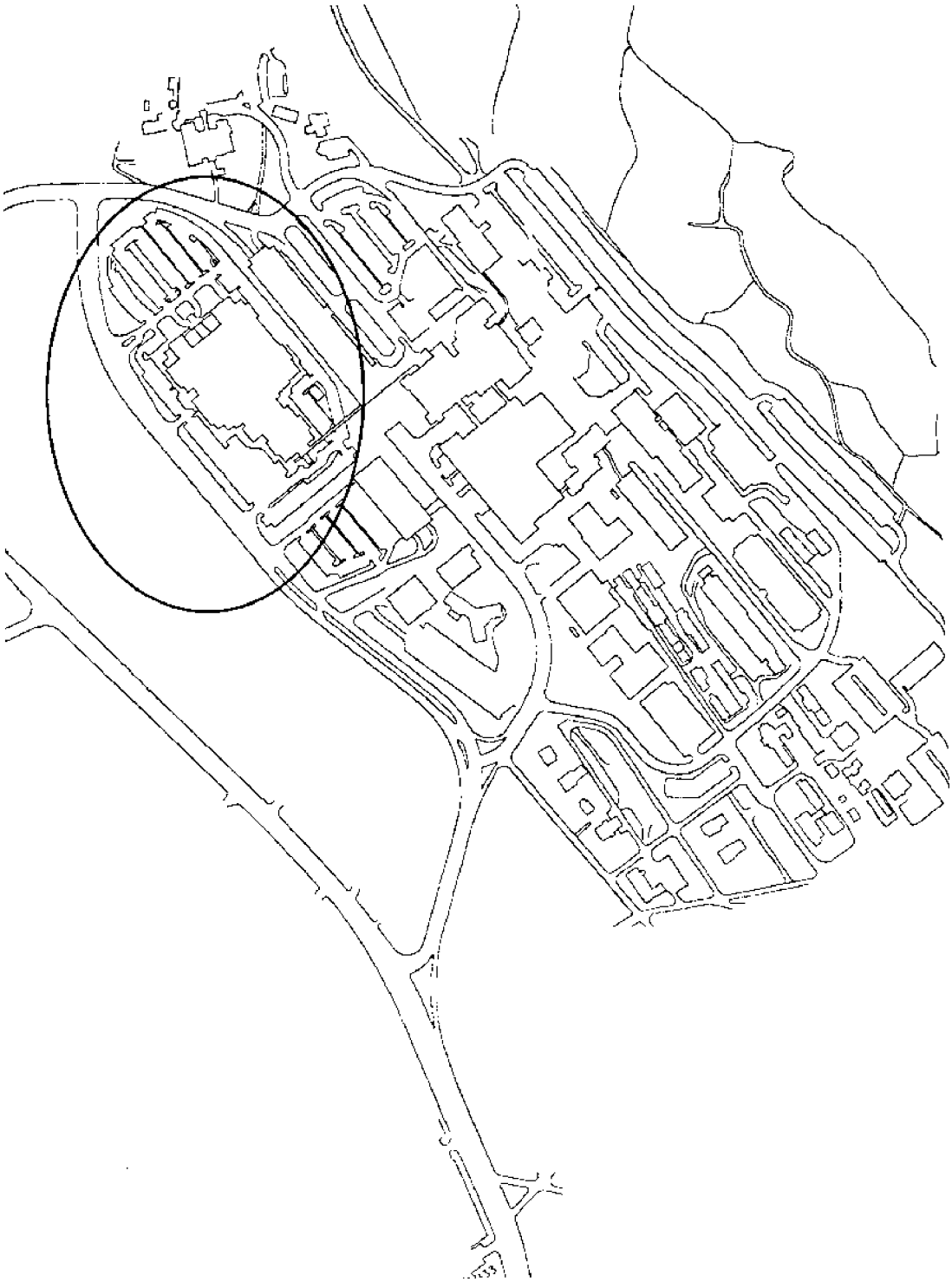

FIGURE 1. Hospital site.

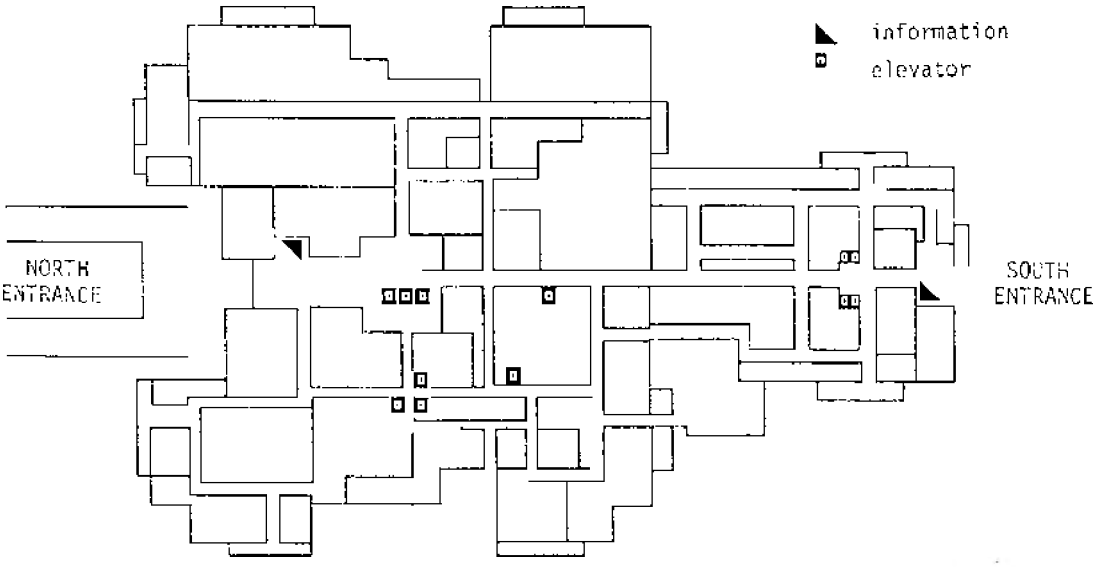

FIGURE 2. Level 1 plan.

is a pleasant and well used landscaped plaza with seating, flowers, and a water sculpture. Architecturally, the inpatient (north) lobby is larger, with a large information desk and an elaborate interior water sculpture. The outpatient (south) entry is really a back door; it is less visible from the main road, less imposing, and later observations showed that its information booth is less likely to be staffed or equipped with copies of the floor plan for visitors. The POE was designed to assess whether visitors understood the distinction between outpatient and inpatient areas and parked accordingly.

A final issue that guided our data assessment drew from initial experiences with walking through the hospital to understand the wayfinding issues. The research team members were often approached by hospital staff offering wayfinding assistance. Because their overtures appeared to be a customary response to visitors, it raised the question of how the staff served within the general wayfinding system at the hospital. Previous research shows that work interruptions can provide a potent source of stress (Turnage and Spielberger, 1991) and that workers often appreciate being invited to participate in the change and improvement of work settings (Sanoff, 1992). Consequently, the study assessed how often the staff were called upon to supplement physical wayfinding cues, how they felt about giving directions, and whether they had suggestions for improving the wayfinding system.

METHODS

Interviews

The staff interview, with four close-ended and four open-ended questions, was designed to assess staff involvement in giving directions to visitors, how that involvement relates to work commitments, and ideas for wayfinding improvements. Responses came from staff in inpatient (71%) and outpatient (29%) areas on day (50%) and evening (33%) shifts (16% did not specify shift). The visitor interview, with twenty-two close-ended and four open-ended questions, assessed wayfinding experiences related to locating the hospital parking, entrances, signs, elevators, and direction-asking. Visitors were approached in waiting or other public areas, yielding more interviews in outpatient (44%) than inpatient areas (26%; dual or unspecified destinations were listed for 18%). In short, efforts were made to cover a wide variety of areas in the hospital.

TABLE 1. Summary of methods.

Methods Used	Summary of Samples and Data Collected
Interviews	66 staff interviews regarding direction giving; 47 visitor wayfinding interviews
Diary logs	46 summaries of one week of directions given by staff
Photographs	Documents existing and staff-created signs
Observation	Counts of in and outpatient traffic; 193 observed for initial wayfinding; 13 visitors tracked to destination.
Cognitive maps	School age and toddler unit plans drawn by 11 inpatients and 3 parents

Diaries

Four diary forms, one for each floor, listed specific destinations on the target floor and provided blank spaces for destinations on other floors. Staff were asked to keep the diaries at their stations for a week and simply to check off each destination for which visitors asked directions. Of the 69 logs distributed, 46 were completed at the end of the week, including between 10 and 13 completed diary logs per floor, providing fairly even coverage of the four floors. Remaining logs were lost or ignored. Results should be considered underestimates of the true numbers of requests as diaries have been shown to underestimate fleeting behaviors, such as giving directions (Michelson, 1987).

Traces

Individuals commonly adapt buildings to better suit their needs, leaving visible signs or traces of the changes they have made (Bechtel and Zeisel, 1987). In certain hospital corridors, the staff had tried to improve wayfinding aids by erecting handmade signs. The evaluation team mapped the locations of these signs and then photographed these signs and other problem areas to provide graphic feedback to hospital administration. Because handmade signs were in place, the interview data reflect the presence of wayfinding difficulties even after these attempts at improvement.

Observation of Behavior

Over a two day period researchers spent a total of sixteen hours observing individuals inside the hospital at staggered ten and twenty minute intervals. On a third day, they spent eight hours counting the cars entering the two main lots. These observations provided an estimate of traffic flow to the two different entrances and the initial use of wayfinding aids upon entering the hospital. Thirteen individuals were unobtrusively tracked from the information desk to their destination.

Cognitive Maps

Children who had long stays in the hospital often participated in activities in the Child Life unit, a unit devoted to reducing the stresses of hospitalization and increasing coping skills for patients. A Child Life specialist, as a part of regular activities for patients, had them draw maps to show the route from the level 3 Child Life room to their own rooms in the toddler and school age units. Cognitive maps are known to be limited by the drawing skill of the map-maker, but may provide useful vehicles for revealing where images of places are unclear or distorted (Fisher, Bell, Baum, and Greene, 1991). A summary of methods is recorded in Table 1.

RESULTS AND DISCUSSION

Results are organized along some of the major questions the research addressed, followed by the recommendations to alleviate problems.

What Wayfinding Aids do Visitors Use?

Visitors' specific experiences with various wayfinding aids include the following:

- 85% of inpatient and 35% of outpatient visitors used signs as wayfinding aids.
- 31% of inpatient and 70% of outpatient visitors reported using the information desk.
- 31% of visitors also asked others for directions, usually a staff member encountered in the halls.
- 47% had received directions over the phone, including 65% with outpatient and 15% with inpatient destinations.
- Few had been sent a map prior to their visit — 13% with outpatient destinations and none with inpatient destinations. Most of those who were sent a map reported that they did not use them.
- Visitors praised the staff for their wayfinding assistance. All who used the information desk said the information given was useful; 92% given directions over the phone said they were useful.
- The average visitor relied on two different types of wayfinding aids (i.e., information desk, other staff, signs, maps, or phone directions) to reach their destination.

Is Wayfinding a Problem?

Many staff members perceive wayfinding to be a problem for visitors. When asked, "How often do people ask you for directions?" the average response is 5.6 on a scale ranging from "1, not at all" to "7, very frequently." Two thirds of the staff answered 6 or 7, indicating high perceived frequency for many of the staff. In contrast, when visitors were asked how they felt on a scale of "1, completely sure of my way" to "7, completely lost," the average response was 3.2. It may be that the staff have more encounters with the visitors who experience wayfinding difficulties or perhaps the visitors interviewed did not want to admit or had not yet experienced the more severe difficulties suggested in the staff responses. In either case, there was room for improvement of wayfinding. However, due to the staff members' daily involvements with assisting visitors with wayfinding, staff experiences are emphasized below.

To determine staff involvement in wayfinding assistance, the staff interviews asked, "How frequently do you ask clients if they need help in finding a destination?" The answer was 5.1 on a 1-7 scale ranging from "never" to "always."

When asked if visitor wayfinding requests interrupted their work, 65% of the staff answered yes. Although many (65%) felt this duty was part of their job, it may be that other uses of staff time or more pleasant occasions for welcoming visitors would be more appreciated by both staff and visitors. In sum, staff are often approached for directions, they often initiate wayfinding assistance, these tasks interrupt their work, but they consider them part of the job.

Staff members offered an average of 2.07 suggestions for improving wayfinding. Many staff had given the matter a good deal of thought, as the range was between zero and six suggestions per staff member. In particular, volunteers tending the information desks had many suggestions, reflecting their greater contact with visitors. Selected staff suggestions are quoted below to show how specific and useful staff participation in POEs can be.

In addition to reliance on staff reports, visitors also noted a number of wayfinding difficulties with particular aspects of the wayfinding system:

- A number of visitors used the wrong parking lot, as elaborated below.
- 34% of visitors reported that the signs were confusing, despite their high level of use (85% of inpatient and 35% of outpatient visitors used signs as wayfinding aids).
- Visitors who asked for directions often had to ask more than once during their visit (an average of 1.65 times).

- Visitors who felt the most lost during their visit were less likely to know which lot to park in (Pearson $r = -.33$, $p. < .05$), more likely to judge the signs to be confusing ($r = .45$, $p. < .01$), and more frequently asked people in the hospital for directions ($r = .37$, $p. < .01$). Thus specific wayfinding complaints go with a more marked sense of feeling lost.

Front And Back Doors: Where Are Inpatient And Outpatient Areas?

In spite of the "back door" appearance of the outpatient (south) end of the hospital, a substantial number of visitors use the outpatient parking lot and entrance. In two and a half hours of observation, 34% of the 152 cars entering parking lots entered the outpatient lot. In several hours of pedestrian traffic counts over three days the outpatient entrance received between 34% and 42% of the total visitors (excluding staff with badges from the count).

Although the hospital is not large, there are still problems when visitors enter the "wrong" side of the hospital because they are unaware of the distinction between the inpatient and outpatient ends of the hospital. Visitors using the wrong entrance must walk farther. Directions to a more distant location may be more difficult to remember and follow than directions to a closer destination. Finally, the longer the journey, the greater the possibility of becoming lost. The need for distinguishing inpatient and outpatient areas becomes clear when analyzing problems visitors have with parking and finding elevators.

Finding the right parking lot and building entrance: If visitors choose the correct parking lot, they will enter the correct entrance. The inpatient parking lot has a larger entrance and is easier to see from the road. There are no signs indicating the names of the parking lots. Visitors approaching from the south see a sign, just beyond the outpatient parking lot, indicating five destinations including "main entrance" and "outpatient services." Thus the signs do not reinforce the major distinction between outpatient and inpatient. Those approaching from the north do not have a sign along the road beside the inpatient parking lot; the only outpatient lot sign is parallel to the road, by the entrance, but is partially obscured by a traffic gate post. When asked to rate the signs leading to the parking lots on a scale of 1 to 7 (where 1 is "completely clear" and 7 is "completely confusing"), the average response was 3.9, indicating room for improvement in parking lot signage.

The net effect of the failure of visitors to distinguish inpatient from outpatient areas from the outside was to draw them unnecessarily to the bigger, more visible lot on the north end. Most visitors had not been forewarned of the need to find the correct lot; 61% did not know, before their visit, which parking lot would be closest to their destination (this was true for 69% of inpatient visitors and 56% of outpatient visitors). Staff logs from the north inpatient information desk indicate that 36% (81 of 224) of questions involved outpatient destinations. Similarly 39% of visitors with outpatient destinations reported using the inpatient entrance. Perhaps because of the difficulties of finding the outpatient lot, few inpatient visitors mistakenly chose the outpatient parking lot.

Additional difficulties are evident:

- 53% of visitors had not received any directional information over the phone prior to their visit;
- Only 26% of visitors on their first through third visits knew where to park; this rose to 50% for visitors on their fourth or later visit;
- Of visitors with a specific destination, 31% of inpatient and 43% of outpatient visitors knew which parking lot to use (outpatient foreknowledge is likely higher because about two thirds of outpatient visitors had received directions by phone prior to their visit).

Finding the right elevator: It was also apparent that the outpatient (south) wing and inpatient (north) wing look more distinctive when viewed in plan in Figure 2 than when experienced on a walk into the facility. Once inside, a visitor would see the outpatient area blending into the inpatient area. The view down the central corridor shows one long hall with no visible distinctions between outpatient and inpatient ends. The boundaries between the two areas are not marked by thresholds or any differentiation in color, lighting, surfaces, or textures.

TABLE 2. Staff remarks on inpatient and outpatient areas.

"Need sign at main lobbies (esp. north lobby) directing people to doctor's offices."
"New sign at south information with doctors' names and elevators."
"Figure some way to keep outpatient going down hall and not enter inpatient elevators."
"Better signs needed when people enter the hospital."
"Ease passage between in and outpatient wings."
"People come in the wrong door."
"Post sign by south elevators saying that they can't get to toddlers/school-age unit."
"People get on wrong elevator."
"People park in North lot; but end up walking the length of the hospital for outpatient services."

TABLE 3. Frequently sought destinations (from staff diaries).

Rank	Destination	Requests	Floor
1	Pediatric ICU (PICU)	223	2
2	Medical imaging	115	1
3	Outpatient clinics	107	1
4	Cardiology	83	1
5	School-age/toddler units	70	3

The lack of distinction in the appearance of outpatient and inpatient ends of the hospital on level 1 can mislead visitors into choosing the wrong elevator. Although 86% of visitors said the elevators were easy to find, it was not clear to visitors that elevators gave access to a limited number of destinations. If a visitor enters the hospital from the inpatient (north) side for an appointment with an outpatient (south) clinic on levels 2 or 3, the north elevators will be encountered first. A glance at the layout would suggest to the visitor that the hospital is organized around a long central corridor, making the choice of the north elevator an appropriate one for all destinations above level 1. But if visitors ride the north elevator up for outpatient appointments on levels 2 or 3, they will find that the central corridor terminates only halfway to the south end. Visitors must then return to level 1 and walk to the south elevator, which does access outpatient areas on levels 2 and 3. Finally, additional difficulties are noted in staff comments in Table 2.

Trouble Spots

Table 3 indicates the five most frequently requested destinations. Seventeen additional destinations received between 15 and 47 requests across the week. These diaries cannot reveal what proportion of visitors to each destination experience wayfinding difficulties but they do demonstrate that certain areas receive a large number of visitor wayfinding requests.

A somewhat different way of assessing trouble spots is to follow individuals who ask for directions. An observation of 13 individuals who first approached the information desk (8 at inpatient, 5 at outpatient) suggests that verbal directions help on the first floor better than other floors. The individuals were surreptitiously followed and observed to record any additional instances of requesting wayfinding assistance or making wrong turns. The results show:

- Six had level 1 destinations. These visitors did not take wrong turns and only one person (who started from the inpatient information desk but was looking for the outpatient registration) needed to ask a second time for advice.
- Of the seven with destinations above level 1, only one visitor navigated successfully to the desired destination based on directions from the information desk. Two visitors each took one, two, and three wrong turns.

TABLE 4. Staff comments on PICU.

"Patients/clients can't find PICU waiting room."
"PICU sign needed by walrus picture."
"Out of PICU people can't find the elevators."
"Hallway to patient waiting room (2nd floor PICU) is too dim, people don't walk down dim hallways."

- The worst experience was recorded by one individual who asked for directions twice and took 3 wrong turns.

Returning to the staff logs, additional sources of information provide insight into two particular trouble spots on levels 2 and 3.

Where Is PICU?

The PICU (Pediatric Intensive Care Unit) was the most difficult area for visitors to locate, generating 223 requests for assistance. The PICU waiting room elicited 37 additional requests for directions. Recall that a visitor's initial glance at the floor layout from the lobbies on level 1 suggests a simple, central, double-loaded corridor, with all halls crossing at right angles. But on levels 2 and 3, the floor layout on the north end changes radically, with many diagonal halls radiating from decentralized nurse stations. Previous research emphasized that simple floor layouts provide easiest wayfinding (Weisman, 1981) and that navigational choice points require signs or other wayfinding aids (Carpman *et al.*, 1986). The angled halls on levels 2 and 3 north are not long, but they are not simple and they present visitors with many choice points.

The complex plan may be associated with the following converging lines of evidence regarding wayfinding difficulties for PICU:

- Staff diaries show that Rehabilitation staff on level 2 are interrupted hundreds of times a week for directions. Four stations in particular tallied 184 requests for directions to PICU alone (out of 414 total 2nd floor requests — 44% on that floor), far more than other destinations;
- Staff diaries showed an additional 39 requests for PICU from other areas in the hospital;
- 7 of the 8 staff interviewed from level 2 inpatient areas (excluding PICU staff) spontaneously mention that they are often asked directions to PICU;
- One staff member reported, "I keep my office door closed so I can get my work done. If it's open I get asked where PICU is 100 times a day."
- Staff erected 10 handmade red on yellow signs pointing the way to PICU;
- Staff reported that they placed a plant across the hall from the PICU waiting room door as a landmark for giving directions there (e.g., "Go to the door opposite the plant.");
- Staff also try to help visitors by referring to landmarks already in place (e.g., "Turn at the polar bear picture.").

Table 4 contains additional staff comments on PICU problems.

Where Is the Toddler and School Age Unit?

By examining the plans for levels 2 and 3, it is apparent that problems discussed above regarding the location of PICU are also present for the toddler and school age units on level 3. For example, Figure 4 shows six different hallways converging at the nurses' stations on level 3, north end.

A unique source of data on this area comes from the cognitive maps, gathered by a Child Life specialist working in the Child Life Activity Room on the west side of level 3, as shown on Figure 4. Maps represent the path taken from patient rooms on the north end to the Child Life area on the west side. The first cognitive map, Figure 5, was drawn by an adult visitor. Although she drew all six of the converging

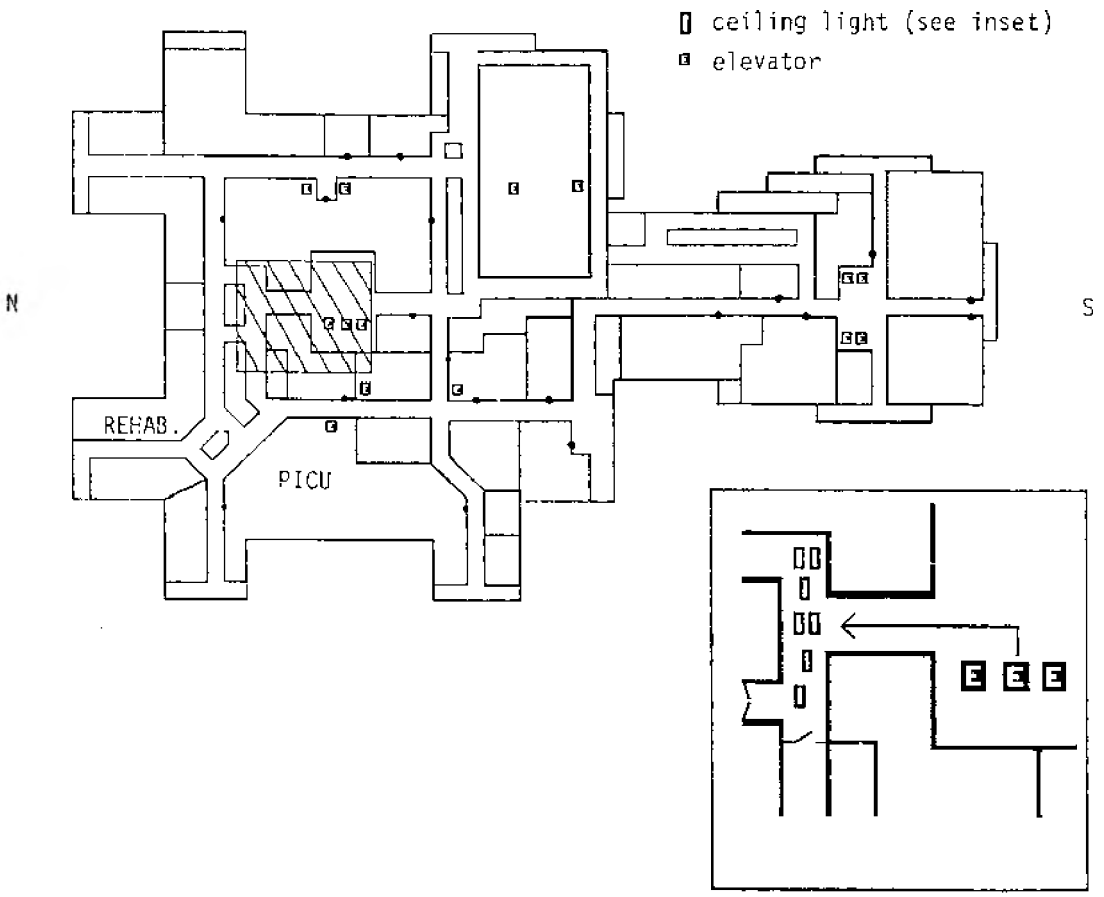

FIGURE 3. Level 2 plan.

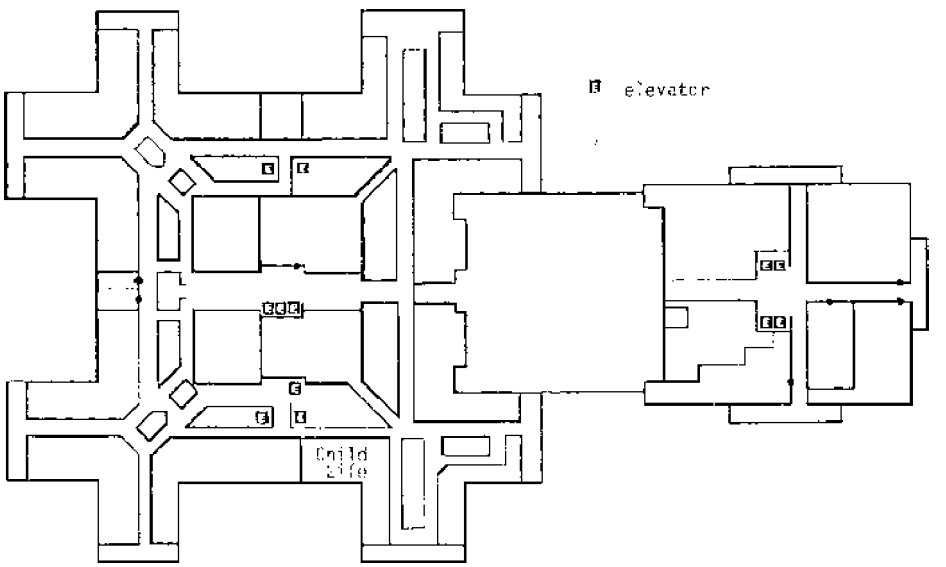

FIGURE 4. Level 3 plan.

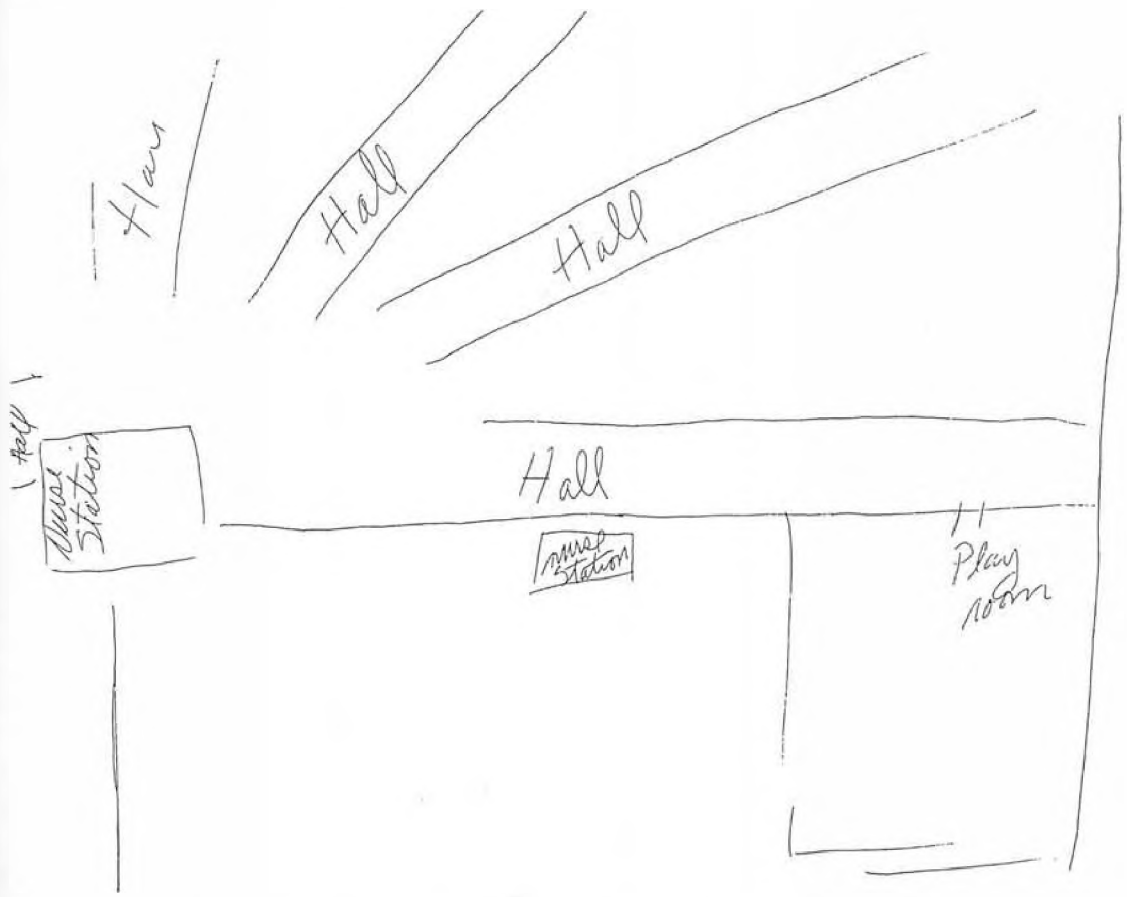

FIGURE 5. Cognitive map showing lack of integration of pathways (on level 3).

hallways, the halls are not connected to each other and the area is not related coherently to the rest of the hospital. Figures 6 and 7 are maps drawn by 12- and 10-year-old patients, respectively, who frequently used the Child Life room. The 12-year-old concentrated on the details of the accurate pathway, but drew confused and inaccurate pathways converging to the nurses' station. The 10-year-old patient also chose to emphasize the correct pathway and linked the nurses' stations as nodes or landmarks, simply ignoring all the other hallways. Although the mapping strategies work for these users, it is clear that the spatial plan of the floor does not facilitate wayfinding. It also reveals how important the nurses' stations are to the landmark-oriented wayfinder.

CUES TO WAYFINDING: SIGNS, COLORS, LIGHTS, ETC.

The two major problems addressed above appear to flow from spatial organization and layout. Yet problematic spatial organization and layout do not necessarily lead to wayfinding problems if enough attention is paid to other facets of the wayfinding system. It is possible that visitors could navigate around corners and through angled intersections if all other facets of the wayfinding system come together to facilitate passage. But on levels 2 and 3, other potential wayfinding cues do not compensate for the complex floor layout; instead, a number of cues exacerbate an already difficult wayfinding problem.

A good example involves the first left turn required of visitors walking north from the north elevators toward PICU (see inset detail in Figure 3). First, it is important to consider the state of mind of visitors

FIGURE 6. Cognitive map showing confusion and inaccuracy in pathways.

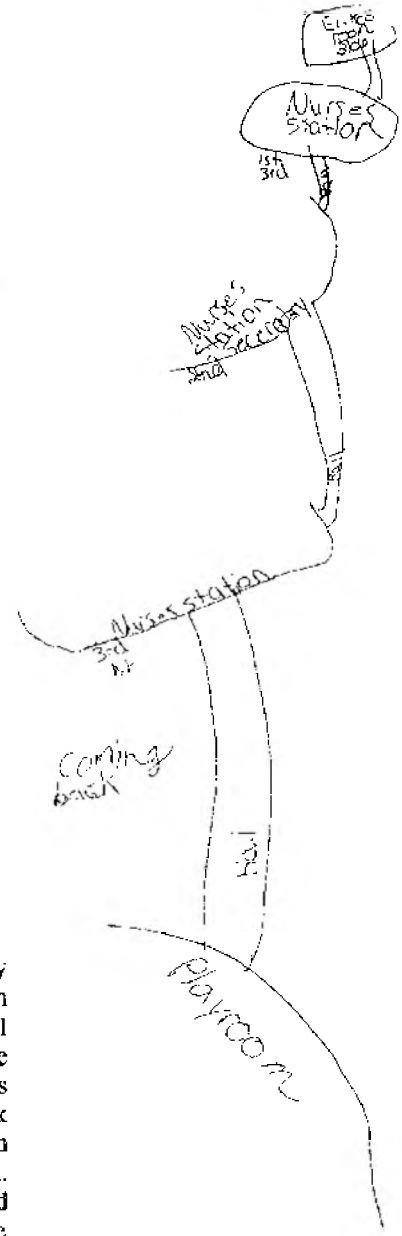

FIGURE 7. Cognitive map that links nurse stations and ignores other pathways.

using this hallway. Although visitor interviews did not directly assess state of mind, visitors in the PICU area often appeared both tired and stressed. This stress may have decreased their normal wayfinding skills. Second, the map visitors may receive at the information desk does not accurately reflect the presence of doors and the size of corridors in this area. A visitor expecting to look left and see the PICU area instead sees a closed door, which blocks the view of the corridor leading to the PICU waiting room. Third, the signs leading from the elevator to the PICU unit had two long but similar terms: Pediatric Intermediate Intensive Care Unit and Pediatric Intensive Care Unit. In fact, these two terms were, for some reason, split between two signs hanging directly over one another. Fourth, the visitor standing at the first intersection (i.e., in front of the arrow on the Figure 3 inset), seeking additional reassurance that a left turn is indicated, sees a large sign to the left of the door leading to PICU, but the lettering is small, too small to read given the distance, the colors, and the lighting. Finally, elements of lighting and size suggest that the correct door to PICU is not a major entrance. The door to PICU is single, poorly lit, and the ceiling is dropped a few inches in front of the door, contributing to the appearance of a small narrow entryway. In contrast, visitors often make a wrong turn into the Rehabilitation unit, which does look like a main entrance; specifically, this entrance has double doors, with a large sign with large letters (larger than the letters on the PICU sign), and a ceiling light panel illuminating the area right in front of the entrance. Lighting placement and amount both seem to be critical cues. If a visitor is deciding whether to turn left

TABLE 5. Staff suggestions for signs.

"Better" signs are needed:
"More appropriate signs needed; they don't explain well."
"Signs off elevators are off to the side; need a sign directly ahead."
"Don't make signs flush with walls — use overhead or hanging out signs instead."
More signs are needed:
"Need signs in middle of hospital."
"Need big sign that says outpatient, clinic, and lab."
"Maps in halls, on each floor, by elevators, and at crossroads."
Bigger signs are needed:
"Signs are hard to read — small and inconspicuous — they need to be bright and obvious."
"Bigger signs — bolder, darker."
Different sign colors needed:
"People don't notice the signs — need different colors."
"Landmark or matching color signs for each department."
"Bright signs that stand out are needed because people are stressed."

at the intersection, a glance to the right shows a hall of about 8 paces illuminated with 3 light panels; a glance to the left shows a hall of about 11 paces illuminated with 2 light panels. One staff member commented, "People don't walk down dim hallways." Consequently, many visitors go through the Rehabilitation entrance where they require additional guidance to locate PICU, which explains the numerous signs erected by the Rehabilitation staff. This extended example illustrates how important the entire wayfinding system is to the diagnosis and remediation of wayfinding problems. It is quite possible that the unusual floor layout could have been easier to negotiate if a variety of cues could be used to draw visitors to the entrance.

Additional sign system problems were noted throughout the hospital. Many hospitals often have problems with sign terminology (Carpman, Grant, and Simmons, 1986); medical terms familiar to staff may be misunderstood by visitors and patients. For example, previous research has shown that many hospital users can understand "pediatric" and "intensive care unit" but many misunderstand "neonatal" (Carpman, Grant, and Simmons, 1986). To compound this problem, interviews with staff and examination of signs and maps showed multiple terms were used for the same places. One destination was variously called PICU, Pediatric ICU, Pediatric Intensive Care Unit, and ICU. Near another destination, the following terms were encountered: NICU, NCCS, Neonatal Intensive Care Unit, Neonatal Critical Care Services, Newborn Intensive Care, and ICU.

A second major source of problems involved inadequate sign or lettering size, color, and positioning, as noted in the staff comments shown in Table 5.

SUMMARY

In keeping with the desire to assure that the project yield information useful to the facility, major recommendations prompted by the findings are summarized in Table 6.

IMPLICATIONS

Aesthetics and Wayfinding

Interactions with the administration underscored their desires to maintain a cheerful, welcoming, noninstitutional image for the hospital. Consistent with this image, the hospital offers regular tours that highlight the comfortable and well used entry gardens and sculpture areas, the children's artwork on the walls, the comfortable carpeting, and soft colors throughout. In addition, the facility has a number of comfort-

TABLE 6. Summary of recommendations.

General Findings:

Visitors' wayfinding questions interrupted staff work frequently enough to justify efforts to improve wayfinding.

Several trouble spots had severe wayfinding problems.

Staff are an excellent source of information about wayfinding problems and potential solutions. Any future wayfinding improvements should involve staff participation.

Visitors, while frequently complimentary of staff, have difficulties with distinguishing between inpatient and outpatient areas, with wayfinding when layouts are not simple, and with understanding sign systems.

Distinguish Inpatient From Outpatient Areas:

As much as possible, warn visitors of differences between inpatient and outpatient areas.

Have all phone contacts for appointments and information note which entry would be closest (92% receiving directions by phone found them useful). Most of the few visitors who received maps in advance did not use them during the visit, so provide additional maps and cues as supplements.

On site cues distinguishing the areas can include exterior parking area signs, color coding, and additional signs on level 1.

New north elevator sign: "To Inpatient Areas. For Outpatient Doctor Visits, use South Elevators."

New south elevator sign: "To Outpatient Areas. For Inpatient Areas, use North Elevators."

Integrate aesthetic considerations with wayfinding cues. Different floors currently use different colors, but visitors rarely confuse floors. Use different color codes to distinguish inpatient, outpatient, and staff only areas.

Update the current visitor map. Replace inconsistent terms within the map and between the map and hall signs. Discard the curren arbitrary color coding and test a new color coding to make important wayfinding distinctions between inpatient, outpatient, and staff only areas.

PICU, Toddler, And School Age Units:

Whenever hallways deviate from a grid orientation (the north side of levels 2 and 3), fortify existing wayfinding cues.

Use color, lighting, and signs to distinguish PICU from rehabilitation areas, areas easily confused because they are not separated by barriers.

Because the nursing stations are landmarks for patients and families, adopt a color scheme that helps with way-finding. Scattered stations had the same color scheme, making it difficult to distinguish them. Other stations, though with different colors, had such a mixture of colors it was difficult to use them as wayfinding aids.

For any nonstandard hallway arrangements, wayfinding devices need to be visible and located at decision points. These decision points are much closer together along the north end of levels 2 and 3 than elsewhere.

Improve Sign Sizes, Colors, And Terms:

Use bigger signs or larger lettering on the signs.

Locate signs at traveller decision points (suggested sign locations are indicated in the larger report).

In the future, select colors of greater contrast. Past research (Carpman *et al.*, 1986) has shown the white on blue colors used on leve 1 are more visible than the white on red used elsewhere.

able areas not always available in pediatric hospitals: parent waiting/sleeping areas with kitchen, meditation rooms, an aquarium, and quiet area in emergency waiting. The result is that the hospital often simultaneously achieves high standards of aesthetics and visitor comfort.

However, in certain respects, aesthetics and comfort worked against each other. Aesthetic concerns meant that signs were never hung from ceilings, lettering size was always limited, and handmade signs were against policy. Although these policies were meant to sustain a visually appealing and noninstitutional feel to the facility, there may be ways of enhancing wayfinding but maintaining aesthetic standards. For example, in the problem area leading to PICU, the signs include a toy soldier motif. Instead of providing additional signs at all choice points along that problematic short but winding corridor, it might be possible to reinforce the existing graphics so that visitors can be advised to "follow the toy soldier" to PICU.

Problems of complex floor layouts may characterize a larger number of hospitals as they experiment with decentralized nurse stations. Research has shown persuasive evidence that nurses spend more time with patients if they work on units with radial layouts and spend more time in transit if they work on units with long corridors (Trites, Galbraith, Sturdavant, and Leckwart, 1970). When hospital designers eschew long halls for shorter halls and more radial plans, there are other consequences to consider beyond the time staff may spend with patients. Wayfinding may become more problematic with radial designs, as shown in the present study, and the decentralized flow of staff traffic may decrease opportunities for important informal conversations and consultations among staff, as suggested by Stoller (1988).

The present research also underscores a point already established in the POE literature — that it is unreasonable to expect administrators or architects to comprehend potential post-occupancy problems without conducting systematic evaluations (Sommer, 1983). Administrators with daily but distant familiarity with their facilities may underestimate the discomfort and difficulties visitors experience with wayfinding. An architect for the hospital system, for example, anticipated that the scissor stairs visible from the outside through the glass wall at the north and south ends of the building and the central spine corridor connecting the two stairwells provided simple and strong design cues to help with orientation. Over the course of the research, no staff or visitors ever mentioned the scissor stairs. Instead, the mother of one of the evaluation team members reported that she changed doctors in order to avoid having to navigate the parking areas at this particular medical complex. The Child Life specialist felt that patients experience a sense of accomplishment when they can find their own way to the Child Life area. The staff members were gratified that a team was looking into wayfinding problems and listening to their concerns and suggestions. Thus, visitors and staff note the importance of wayfinding in a variety of ways.

The Importance of Triangulation

The present study also underscored how important it is to employ multiple methods in POEs. The discrepancies across methods were especially revealing. For example, the staff interviews suggested that wayfinding was more of a problem than the visitor interviews revealed (visitors only scored a 3.2 on a scale ranging from "1, feel completely sure of my way" to "7, feel completely lost"). The report emphasized the staff perspective because they encounter visitors who feel the most lost and they experience the work interruptions. In another instance, visitors gave high marks to directions given at the information desks, but half of the visitors who were followed after receiving directions took wrong turns or needed to ask for additional directions. Combining self reports with observations shows that visitor satisfaction with directions does not imply wayfinding ease. A third source of information gathered around the information desks was systematic observation of initial orientation strategies for visitors entering the lobby. This third technique revealed that the ebb and flow of visitors was so great that visitors often bypassed the information desk when it was crowded and that some visitors prefer signs to the information desk. Thus, triangulation shows that any improvement of directions given by volunteers at the desk would not solve all wayfinding problems; additional wayfinding elements are needed for busy times and for those who orient with signs. Although it is sometimes difficult to anticipate the outcome of trying to consolidate information across different methods, the consolidation process yields a more comprehensive understanding of the phenomenon of interest.

Reflection on the POE as a Class Project

The research project was conducted by a six student environmental assessment seminar. The goal of producing a useful report for an outside agency can enhance student time and energy commitments and motivate a polished performance. However, despite the class exposure to Anthony's (1987) description of pros and cons of a class project POE, similar pitfalls befell the current project. The final written report was difficult to coordinate and some students did not have the necessary writing skills. Because of the high expectations for a quality product and the relative inexperience of students with research, the professor's role was very active and time consuming. Depending on the progress of the major project, other course requirements were adjusted (although a colleague noted that some students dislike such adjustments).

Is it worth the trouble to offer this type of class? The benefits are many. The class was designed after the professor heard social sciences graduates at a national conference complain that their college education had left them unprepared for the politically charged and personally difficult aspects of working with a group. All past seminar groups have suffered phases of interpersonal friction and inefficiency, yet surviving the experience is perceived as an accomplishment. Students write two papers, one designed for an agency, the other for a social scientist. Thus students learn how to translate information across disciplines, develop an in-depth understanding of one setting, experience firsthand the pros and cons of several social science methods, persist across all phases of social science research, and gain a résumé entry.

The disadvantages relate to the time constraints of the ten week quarter. Consider these milestones: facility tour in week three; meet with administrators in week five; final instrument revisions in week eight. Data collection, entry, and analysis consumed weeks eight through ten. Such a rush leaves little time to consolidate and reflect on the experience and the final facility tour for the administrator spilled over into the summer break. Although scheduling problems are lessened if the POE site is chosen in advance by the professor, students also seem to feel less ownership and motivation for such projects, perhaps lowering their overall scope and educational impact. In sum, the benefits are great but time costs for professors are substantial.

CONCLUSIONS

Wayfinding is an important but overlooked issue in many facilities. In the present study, the hospital revealed the well known problems of floor plan complexity, signage, colors, and other specific wayfinding aids. In addition, the problems with distinctions between outpatient and inpatient areas deserve greater investigation as outpatient areas become more prominent in hospitals. The design of outpatient areas may not be sufficiently salient and distinct from inpatient areas to ease visitor wayfinding. The present study also reinforced the importance of using multiple methods to understand wayfinding and to pay special attention to the entire complex of wayfinding cues in particular trouble spots.

The study also confirmed that administrators and architects cannot be expected to see their facilities through the eyes of visitors; only systematic POE information can provide the insight needed for continuous facility improvement. Administrators of good facilities encourage a regular evaluation and modification process to satisfy employee and client needs throughout the life of the building (Preiser *et al.*, 1988).

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