ENVIRONMENT-BEHAVIOR RESEARCH APPLIED TO DESIGN: THE CASE OF ROSEMEADE HIGH SCHOOL

Kathryn H. Anthony

This article describes an application of environment-behavior research to the re-design of a high school campus in Rosemead, near Pasadena, California. The immediate goals of the project were to make design recommendations which the school could implement with relative ease and little expense. Its long-range goal was to try to restore the school's image to its original grandeur. Multiple methods were used to complete the research, including behavioral observations, examination of physical traces, review of school archives; interviews with the original school architect, students, faculty and staff; questionnaires of students, faculty and staff; and student cognitive maps. Research findings generated a list of priorities for the school, which were then translated into design recommendations. Since the study was completed, the school has implemented some of the suggestions made by the research. With diminishing funds available from traditional sources, administrators of facilities like Rosemead High School are forced to look elsewhere for needed services. Universities abound with large numbers of pre-professionals anxious to apply their newly-learned skills in the "real world." This study can serve as a prototype for similar cooperative efforts between University campuses and nearby facilities.

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INTRODUCTION

After a slow start, the application of environment-behavior research to design is on the increase. The recent special issue of Environment & Behavior (Kantrowitz and Seidel, 1985) attests to this trend. With the notable exception of the work by Preiser (1981), Matsas (1975), and Clinkenbeard (1976), little work has been done applying environment-behavior research to the design or redesign of high school campuses. Instead, most of the literature on school settings has addressed student behavior and classroom seating arrangements (Stires, 1978; Sommer, 1967; Walberg, 1969; Adams and Biddle, 1970; Koneya, 1976; Wulf, 1976; Rist, 1970; Delele and Jackson, 1972; Schwebel and Cherlin, 1972; and Becker et al., 1973), classroom design (Proshansky and Wolfe, 1974; Kephart, 1954; Zifferblatt, 1972; Weinstein, 1977; Evans and Lovell, 1979; Gump and Good, 1976; Santrock, 1976; Horowitz and Otto, 1973; Burns, 1972; and Sommer and Ohlsen, 1980) classroom density (Byrne, 1961; Sommer and Becker, 1971; Freedman et al., 1971; Stokols, 1976; Gochman and Keating, 1976; and Schettino and Borden, 1976), and classroom noise (Brunetti, 1972; Walsh, 1975; Bronzaft and McCarthy, 1975; and Cohen et al., 1979).

The controversial issues of windowless (Karmel, 1965; Chambers, 1963; Tikkanen, 1970; Demos, 1965; Collins, 1975) and open classrooms (Weinstein, 1979; Educational Facilities Laboratory, 1965; Gores, 1968; Meyer, 1971; Durlak et al., 1972; Rivlin and Rothenberg, 1976; Gump, 1974; Gump and Good, 1976; Wright, 1975; and Grapko, 1972) have also merited much attention in the research community. The classic ecological study by Barker & Gump (1964), later replicated by Willems (1967) and refined by Wicker (1968) examined the relationship between high school size and participation in student activities. A recent piece by Wistrorski et al. (1983, p. 55) classified educational environments and related these characteristics to disruptive behavior in school. While these studies help provide a frame of reference for the following work, most of them focused on a single variable or set of variables. The study which follows examined the high school from a more holistic approach -- not defining variables of concern before beginning the project, but rather identifying the relevant variables as part of an evolutionary process once the project was already in progress.

This case study summarizes a faculty-student research project whose findings were applied to the redesign of a high school campus. Like many other high schools in recent years, the campus of Rosemead High School, near Pasadena, California, had fallen into a slight state of disrepair. Originally built in 1949 and designed by architect Henry Wright, the school upon opening was a showpiece for the Los Angeles area. Its strict adherence to the Streamline Moderne Style made it an attraction both for architects and for school administrators from far and wide. (See Figure 1.)

Over the years, however, with its current student population of about 1500, the school buildings had begun to show their age. Some of the sawtooth roofs have had serious leaks. Inadequate drainage, inoperable windows, insufficient storage, poor quality lighting and faulty electrical outlets had all posed problems to administrators and staff. Oppressive heat within the building sometimes interfered with student learning and staff operation. In addition, floors, windows, classrooms, hallways, restrooms, lawns, and plantings needed to be better maintained.
The Superintendent of El Monte Union High School District contacted the Department of Architecture at nearby California State Polytechnic University, Pomona, to see if it might help solve some of their problems. At that time, a graduate course in "Behavioral Factors in Architecture" specialized in teaching architectural students social science research techniques -- such as interviewing, developing questionnaires, and observing behavior -- and applying them to the solution of design problems.

The class completed a campus beautification study of Rosemead High School the following fall. Timing was crucial; the project was incorporated into the students' course outline, due dates were assigned for various components, and appropriate contacts were made at the high school. The project began early in the term, with a class meeting with the Principal of Rosemead High. He offered a tour of the campus, introduced key faculty and staff members at the school, and generously offered his cooperation and support throughout the project.

The immediate goal of this project was to make design recommendations which the school could implement with relative ease and little expense. The long-range goal was to try to restore the school's image to its original grandeur. Key issues and areas addressed included the image of the school as a whole and the comfort, utility, and aesthetics of classrooms, staff work spaces, outdoor public areas, and circulation spaces. The work was completed during a relatively short period of 10 weeks, or one academic term.

METHOD

To address these issues, a multi-method approach was used, as suggested by Zeisel (1981, p. 87, 228-229), Sommer and Sommer (1981, pp. 7-8), and other social science research methodologists (Kidder and Judd, 1986; Kerlinger, 1986). (See Table 1.) Behavior observations were taken at two central outdoor areas, Panther Square and the Senior Patio, during a period of six hours. Spot checks were conducted to see how many students were present, what they were doing, and where they were located. The data were recorded through data sheets, maps, and photographs.
TABLE 1. ISSUES AND METHODS ADDRESSED

<table>
<thead>
<tr>
<th>Issues Addressed:</th>
<th>Comfort, Utility, and Aesthetics of...</th>
<th>Image of School</th>
<th>Staff Work Spaces</th>
<th>Outdoor Public Areas</th>
<th>Circulation Spaces</th>
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<td>Methods Used:</td>
<td>Behavior Observations</td>
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<td>Physical Traces</td>
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<td>Cognitive Maps</td>
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Physical traces were examined in detail in both indoor and outdoor areas: classrooms, hallways, Panther Square and adjacent outdoor spaces, and the restrooms. Over 30 years' worth of school archives were reviewed. These included the Pantherama, the school yearbook; The Panther's Tale, the school newspaper; and The Rosemead Independent, local community newspaper.

The school's original architect, Henry Wright, was interviewed about his design intentions as they pertained to the development of the campus master plan. Eight students and ten faculty and staff members were also interviewed about their image of the school, their favorite and least favorite places on campus, where they spend their time before and after school, where they usually eat lunch, their opinions about campus maintenance, and suggestions for improving the physical appearance of the school. The results of the interviews formed the basis of the subsequent questionnaires.

A total of 209 students (14% of the school population) were administered a questionnaire during their English class. The questionnaire consisted of 21 items, all but one of which were closed. Questions were modifications of the interview items and were based in part on those used by Preiser (1981). A four-point scale was used to rate various characteristics of the high school campus. Respondents were also asked to rate several options for improving the campus, suggested in the interviews, as either high, medium, or low priority. Our emphasis on developing a list of priorities was to enable us to easily transfer the results into design recommendations. The same questionnaire was also given to 20 faculty and staff members (30% of the faculty and 11% of the staff population). Finally, 13 students completed cognitive maps of the campus on a blank sheet of paper. The classic study by Lynch (1960) was used as a model for recording respondents' images.

A content analysis and descriptive statistics were used to interpret the data. Cognitive maps were analyzed for accuracy and in terms of Lynch's typology. Due to the design students' minimal training in social science research, more sophisticated data analysis techniques were not used. The intention was to limit the analytic techniques to those which both the design students enrolled in the course and the school administrators and school board officials could easily comprehend.

Two reports were prepared: one was delivered in the form of an illustrated verbal presentation, the other was an extensive 180-page illustrated report (Anthony, 1982). Both were delivered to the high school principal. Along with these, a graphic presentation of poster boards and photographs was displayed in the high school corridors. Below is a summary of what was found.
RESULTS

Behavior Observations

Behavior observations revealed that most social interaction in Panther Square consisted of
groups of three or four, all males or all females. All available seating areas -- benches, pic-
nic tables, wall ledges and grassy areas -- were fully occupied. Typical activities included
eating lunch, talking, practicing guitar, rehearsing cheerleading routines, and selling tickets
for Homecoming events. Many students walked through the area, while others simply stood
around. At Senior Patio, students sat on large tables in larger groups, boys and girls
together listening to the radio and talking. Up to 130 students were present in each spot.
All activities took place in the shade. Outdoor corridors adjacent to both spots seemed to
be student hangouts.

Physical Traces

Physical traces revealed that outdoor areas were generally well maintained. Indoor cor-
ridors were in fairly good condition, although dark and generally unpleasant. Scattered bits
of litter (candy wrappers and crumpled up notebook paper) and some graffiti were visible.
Numerous bicycles were parked in an ad-hoc fashion, locked to columns and fences. Many
students left their bike locks on school fences, even when their bikes were elsewhere, simply
to mark off their own territory.

In the restrooms, an abundance of graffiti was found in the stalls, trash was on the floor,
and cigarette butts were in the toilets. As is typical of many high school restrooms, the air
was smoke-filled. In a few bathrooms, sinks were missing and windows were broken. In
general, the restrooms appeared to be places for teen-agers to "be free," to escape from
authority figures such as teachers and administrative staff.

Archives

Archives indicated that students seem to devote little conscious attention to their physical
environment. As in most American high schools, coverage of sports, dances, cars, boy-girl
relationships, holidays and the selection of the Homecoming Queen dominated student publi-
cations. The school newspaper was a microcosm of high schools throughout the United
States and seemed to encapsulate American history over the last several decades, from the in-
sular thinking of the 1950's, which let the adults worry about Communism and McCarthysim,
to the angry student editorials on campus violence in the 1970's, and the politically attuned
editorials of the 1980's. Each year, many columns of print were devoted to the de rigueur
anti-litter and anti-smoking campaigns; periodic angst over whether Rosemead High School
had its quota of school spirit and pride was also noted.

Several places on campus had attained a "sacred status" over the years, and they were
recurring themes in school copy and photos. The first was the Senior Patio, a highly sym-
bolic area for seniors. Although it had been defaced by rival underclassmen several times
over the years, any damage was immediately repaired. The second area was Panther Square,
the place where students congregated to demonstrate their school spirit. In every photo of
this area taken during pep rallies, only a few students sat comfortably on benches, while the
rest milled around on what seemed to be acres of blacktop. A 1981 student editorial called
for more trees and landscaping for Panther Square and the rest of the campus. More informal school publication photos showed that students willingly used grassy areas eating lunch and socializing on the "postage-stamp" areas of grass which now exist. A third area, the front entrance, appeared to be most symbolic of the school image. The facade appeared on the cover or endplates of many yearbooks, and was the favored spot for group photos.

*Interview with the School Architect*

Henry Wright, the original architect of Rosemead High School, explained that one of the school's fundamental design features -- and an innovation at that time -- was natural cross-lighting, which unfortunately had to be compromised in bringing the building into compliance with fire codes. In addition, Mr. Wright said, the then relatively recent development of fluorescent lighting was used throughout the buildings, but because it was not yet perfected, it produced a harsh light and was not energy efficient.

*Student Interviews*

Most of the eight students interviewed expressed some dissatisfaction with the buildings and grounds of Rosemead High. Most complaints were directed towards the lack of noon-time activities and the general state of disrepair on the campus. Most students interviewed frequented In-N-Out Burger for lunch; others visited McDonald's, Dog-It, and Mr. Bill's, all fast-food establishments. All those interviewed preferred to buy their lunch off campus and bring it back to school to eat. Some expressed interest in eating at the park next to the school, but were afraid of the police asking them to leave. Surprisingly enough, most students had never even set foot in the cafeteria.

As for as physical changes to improve the campus, painting the school was the unanimous choice. Favorite colors were white, maroon, and gray. Other suggestions included adding trees and grass to Panther Square, adding more benches to outdoor areas, buying new trash cans or painting the old ones, and improving lighting in the restrooms.

*Faculty and Staff Interviews*

Most of the ten faculty and staff members interviewed commented that the school needed upgrading and that it was too old. Others called it "pleasant," "practical," "efficient," and "uninspired." All indicated that campus maintenance was poor, pointing out a need to attend to grounds, landscaping, buildings, and equipment. Special concerns were the lack of maintenance personnel and student litter. When asked about physical improvements, the most popular response was air conditioning. Other suggested improvements included more gardening, surrounding the campus with a fence, and painting the school. One of the more pessimistic respondents believed the campus was beyond repair.

*Student Questionnaires*

Of the 209 respondents, most rated the image of the school grounds most negatively. Table 2 shows a comparison of ratings of different school features. A surprisingly large group, two thirds (67%) of the students who completed the questionnaires, ate lunch off campus. Most usually ate in large groups, as shown in Table 3.
TABLE 2. ENVIRONMENTAL FEATURES RATED ONLY "FAIR" OR "POOR" BY HIGH SCHOOL STUDENTS (N = 209)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Rating</th>
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<tbody>
<tr>
<td>Image of the school as a whole</td>
<td>72%</td>
</tr>
<tr>
<td>Maintenance of school buildings</td>
<td>67%</td>
</tr>
<tr>
<td>Appearance of outdoor plazas</td>
<td>66%</td>
</tr>
<tr>
<td>Temperature control in school buildings</td>
<td>64%</td>
</tr>
<tr>
<td>Maintenance of school grounds</td>
<td>60%</td>
</tr>
<tr>
<td>Appearance of indoor corridors</td>
<td>59%</td>
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</tbody>
</table>

Regarding areas of the campus in which to improve maintenance, the overwhelming response (55%) was restrooms, followed by outdoor school grounds (23%), the outside of the buildings (13%), and classrooms (8%). Concerning possible changes to the school, most saw painting it as top priority. Other high priority items are listed in Table 4. If the school were to be repainted, two-thirds of the students (67%) felt the front facade should be painted first. When asked which color they would like to see the school painted, white, maroon and gray won out. If more seating were added outside, most (68%) prefer picnic-table-and-bench combinations.

Faculty and Staff Questionnaires

Because of the fairly small sample size, only major findings are highlighted. The image of the school grounds was seen by most of the 20 faculty and staff questioned as only "fair." Most rated the appearance of outdoor plazas as "good," and appearance of indoor corridors and maintenance of school buildings as "fair." Most gave a "poor" rating to temperature control; in fact, inadequate climate control seemed to be this group's biggest complaint. In contrast to the students, most faculty ate on campus in the cafeteria.

As for improving maintenance of existing spaces, restrooms were a number one priority; classrooms, number two; outdoor grounds, third; and the outside of the buildings, fourth. Concerning possible changes to the school, painting was top priority. If the school were painted, faculty and staff felt the first places to be touched should be the front facade and the interior corridors and hallways. Most popular color schemes among the faculty and staff sampled were tan, white and brown. Most preferred type of seating for outdoor areas were picnic tables and benches.

Cognitive Maps

Results of the 13 student maps showed that most were fairly similar. Students' sketches emphasized the Administration Building, the auditorium, the parking lot and the gymnasium by drawing them in heavy lines and overscroing. Classroom blocks and locker rooms were also among the strongest images. In terms of Lynch's (1960) typology, most students perceive the campus in terms of edges, paths and landmarks. Panther Square was one of the most commonly cited features.
Building Program

Based on the research findings, programmatic guidelines were developed for each of the following: A. Building Facades, B. Boundaries of Campus, C. Classrooms, D. Staff Workspaces, E. Panther Square, F. Restrooms, G. Indoor Corridors, and H. Outdoor Corridors.

Each area contained a list of findings and the sources on which they were based -- whether they were personal experience, results of the questionnaires, interviews, or other research methods used, or relevant findings from previous environment-behavior literature. Recommendations were listed in terms of relative cost. Where appropriate, a variety of options ranging from no cost, low cost, medium cost, to high cost were suggested. An attempt was made to offer school administrators a variety of alternatives which could be considered in light of their budgetary allowances. In the final report, the building program was supplemented with photographs and sketches of the campus "as is", and representations of what "could be", i.e., what improvements could be made. These were in the form of drawings, sketches, plans, and photographs. Here are some sample recommendations which reflect some of the most important findings.

1A. BUILDING FACADE

Findings: Questionnaires and interviews revealed that students, faculty and staff rate painting the school a high priority. Both groups preferred to paint the streetfront facade first. Archives also showed that the physical appearance of the buildings, especially the front of the Administration Building, had taken on much importance and symbolic value throughout the school's history. It is central to the school's positive image in the community.

Recommendations:

Low-Cost Options
- Paint just the front facade of the school's Administration Building which faces Mission Drive.
- Paint the front facade of both the Administration Building and the Auditorium which faces Mission Drive.

Medium-Cost Options
- Paint the entire exterior of the Administration Building, front, back and sides.
- Paint the entire exteriors of both the Administration Building and the Auditorium.

High-Cost Option
- Repaint the exterior of all school buildings.

1B. BUILDING FACADE

Findings: Faculty and staff interviews revealed a need to improve landscaping directly in front of the school.
Recommendations:

Low-Cost Option
- Concentrate new landscaping in a few strategic locations, such as directly outside the administrative offices, facing the street.

High-Cost Option
- Relocate the parking lot in front of school to some other location and replace it with landscaping. This alternative is highly unlikely, however, given its cost.

2. PANTHER SQUARE
(Figures 2 - 4.)

Findings: Student interviews and questionnaires revealed that out of the entire school population, relatively few students ate lunch in Panther Square and that most students ate off campus. The Square has a minimal amount of sitting space. However, observations indicated that most available seating in Panther Square was taken during lunch hour. More seating is needed to attract a greater number of students to Panther Square. Student interviews and student, faculty and staff questionnaires indicated a preference for more picnic tables and benches in this area.

Recommendations:

Low-Cost Option
- Add more seating to central area of Panther Square only.

Medium-Cost Option
- Add more seating to Panther Square in the southern section, near the student store, The Panther's Lair, student government headquarters, and the student cafeteria. This could be in the form of picnic benches and tables, or in table and chair arrangements. If some supervision were provided, adding umbrellas to these seating areas would make them much more attractive. Adding seating in this area might encourage greater use of the student store and Panther Lair as student activity centers.

3. INDOOR CORRIDORS
(Figure 5.)

Findings: Observations of physical traces showed several indoor corridors to be poorly lit. Original skylights provided by the architect had been covered because the wood "egg-crate" design was difficult to maintain and the glass panes were often broken.

Recommendations:

No-Cost Option
- Regularly maintain the lighting fixtures in the corridors. Replace bulbs when necessary.
Figure 2. Panther Square, Rosemead High School's Main Social Space.

Figure 3. Proposed Changes to Panther Square.
The plan above shows the proposed improvements to Panther Square and the adjoining areas.

Figure 4. Proposed Changes to Panther Square.

More lighting fixtures should be added to illuminate dark corridors. Color graphics added to large blank wall areas can also help to brighten otherwise dark interior areas.

Figure 5. Proposed Changes to Indoor Corridors.
Medium-Cost Option
- Install more fixtures in corridors.

High-Cost Option
- Restore original skylighting system to improve lighting and to revive the building’s architectural integrity.

CONCLUSIONS

In sum, based on the findings of this research, if school administrators could only implement a few recommendations, the following were suggested:

1. Improve maintenance in the existing facility, especially in restrooms, indoor corridors, staff workspaces, and classrooms.

2. Paint the street-front facade of the school.

3. Add more landscaping and seating to Panther Square.

It was suggested that students could undertake many proposed recommendations as part of a supervised activity. If the students themselves participated in beautifying the campus, they would be more likely to help maintain it properly because they have a vested interest in it. Environment-behavior researchers have discovered this to be the case in many other settings, be they dormitories, public housing projects, or neighborhoods. Assuming the same might be true at Rosemead High School, it is quite probable that much of its original grandeur may return.

AN UPDATE

The School District has considered the suggestions proposed from this research and has implemented some of them as funds became available. Since this study was completed, two of the three general recommendations listed above have been put into effect. More specifically, the hallways in the school’s upstairs administration building have been remodeled with new lighting. Air conditioning, new awnings, and windows have been installed in the Administration Building, and extensive landscaping has been added to the front of the school. In addition, the entire school has been repainted in school colors, white, maroon, and gray.

The project was not without its problems, however, if only behind the scenes. While most university students participating were conscientious about their work, a few were not, forcing others to pick up the slack. The biggest obstacle was writing the report. Most architecture students lack rigorous writing experience and hence produced incoherent written drafts requiring several sets of revisions. The burden fell on the instructor, with the assistance of a few of the top students, to undertake major re-writes and complete the final draft in a form suitable for submission to school administrators in time to meet the deadline.
This applied research project also produced some positive pedagogical outcomes (Anthony, 1986). Students felt more accountable and, more likely than not, produced higher quality work than they would have otherwise, in large part because they realized someone other than merely their instructor was interested in their results. The pressure to meet a deadline was real, not artificial, and the class worked hard to make it. Furthermore, the link with the high school principal -- a key decision-maker at the site who had a sincere interest in implementing our results and was willing to provide us with easy access to students, faculty, staff, and all campus facilities -- was crucial to the success of this project. In addition to gathering and analyzing data, class members also gained valuable experience presenting their work in written, oral, and graphic format to a professional audience. A copy of the final report was given to all students to include in their portfolios.

Based upon this research, what kinds of generalizations can be made? In retrospect, this study of Rosemead High School can be seen as a prototype for applied environment-behavior research. Cooperation between local facilities such as high schools with nearby colleges and universities can be critical in times of dwindling budgets and increasing personnel cuts. The outside organization, in this case the high school, benefits from applied research which otherwise would be impossible to accomplish. No professional firms even in the cosmopolitan Los Angeles area offer the type of services provided by university faculty and students. The documentation of problems and proposed solutions through systematic research offers administrators even greater credibility when presenting their requests to those higher up, in this case the School Board. Students and faculty benefit by supplementing their university studies with some real-world, "hands-on" experience, an invaluable component of the learning process. Finally, it should be noted that the design changes actually implemented in this case may be considered somewhat minimal. However, given the limitations of this project and the school's budget, improvements of any kind are something to celebrate.

REFERENCES


Additional information may be obtained by writing directly to the author at School of Architecture, University of Illinois at Urbana-Champaign, 608 East Lorado Taft Drive, Champaign, IL 61820.

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