

EXECUTIVE SUMMARY

Problem

School officials across the U.S. increasingly recognize the impact of environmental quality of the school upon the educational process. A recent report published jointly by the U.S. General Accounting Office (GAO) and the Department of Health and Human Services entitled "School Facilities: America's Schools Not Designed or Equipped for the 21st Century" reports that one in five U.S. children are estimated to be affected by poor environmental conditions. Nineteen percent of schools in the U.S. are experiencing indoor air quality problems, 27 percent are reporting poor ventilation, and 19.2 percent report unsatisfactory heating. Other problems in the nation's schools include lack of building security, poor lighting and insufficient noise control. The GAO estimates a cost of \$112 billion to alleviate poor environmental quality in the nation's schools.

Deteriorating conditions caused by poor indoor air quality, asbestos abatement, fire code violations, and deferred maintenance policies are publicly recognized as major contributors of serious health and safety problems for students and teachers. Additionally, environmental quality may affect behaviors, attitudes and performance of students and teachers which may, in turn, have an impact on organizational effectiveness and educational outcomes.

What role these environmental factors play in influencing educational effectiveness and outcomes, and how they interact in contributing to educational quality is less understood.

Approach

In order to clarify the link between environmental factors and the educational process, this study begins with the investigation of environmental qualities directly experienced by students, teachers, staff and parent volunteers in five school settings in the Baltimore City Public Schools. Although the individuals from every group were interviewed, teachers were found to be the most involved in the process.

This study is particularly interested in uncovering those environmental quality concerns that school occupants see as supporting the purposes, activities and educational goals of the school. How well the physical setting responded to the demands of the educational process comprised its environmental quality or value.

In addition, this study has been designed to provide an example of how a school might begin to improve environmental quality through an organizational development process of identifying and addressing mismatches between the facility and its educational activities, programs and goals.

Objectives

The objectives of the Baltimore Environmental Quality Assessment Project project were the following:

- (1) Develop an Environmental Assessment Process

Develop an occupant-driven environmental quality assessment process through which environmental quality concerns can be creatively identified, addressed and influenced by school occupants themselves.

(2) Complete Environmental Assessments

Define and assess environmental quality from the perspective of the experiences of students, teachers, staff, administrators, and parent volunteers in each of five Baltimore City Public Schools that chose to participate in this project;

(2) Determine Possible Links to Educational Process

Understand how environmental quality may or may not contribute to the educational process in each school with respect to Student Academic Performance, Student Social Development, and Teacher Instructional Performance; and,

(3) Determine the Role of Facility Management

Understand the role of facility management in maintaining and improving environmental quality.

The assessment process was not conducted to judge the final worth or merit of the school as it relates to environmental quality. Rather, the intent of this project was to provide information and insight to educators useful for improving the environmental qualities of their schools, especially those that may have some impact on the effectiveness of the educational process. A major objective of this study was the clear identification of the perceptions of occupants in these schools. This objective should be seen as a first step in attempting to resolve environmental concerns of issue in these schools.

It is the hope of all involved, that the results of this study be considered an affirmative step toward improving environmental quality in the Baltimore City Public Schools.

Process & Procedures

Each school case study investigation followed a research process in which a selected number of teachers and administrators participated in actively clarifying the scope of the project, identifying and prioritizing environmental quality problems, issues and concerns, and formulating strategies for addressing these concerns. The project activities and assessment process was conducted within a seven month period between August, 1995 and February, 1996. (See Appendix C for a full description of the assessment process including all interview guides, survey forms, and workshop agenda.

Case Study Selection Process

A case study selection process involved the identification of a limited number of then interested Tesseract schools. Once two Tesseract schools agreed to participate, match schools were identified with the assistance of the Baltimore City Public Schools. In addition to these four schools, a fifth 'hybrid' school, that is privately managed, but not a Tesseract school agreed to participate in the study as well.

Match schools were chosen with respect to their physical characteristics, two being self-contained schools, two, plus the hybrid, being primarily open plan schools (with self-contained classrooms).

By August 1995, five schools agreed to participate in the Environmental Quality Assessment Project:

Tesseract Schools

- Mildred D. Monroe Elementary School #32 (self-contained)
- Dr. Rayner Browne Elementary School #25 (open plan)

Match Schools

- Coldstream Park Elementary School #31 (self-contained)
- Harriet Tubman Elementary School #138 (open plan)

Hybrid School

- Robert W. Coleman Elementary School #142 (open plan)

Participant Selection

Once case schools were identified, participants were selected to form a working group that followed the project. Principals from each school identified three teachers, an instructional specialist and at least one parent volunteer who were interested in participating in the project. Students participated through a 5-item survey administered by their teachers. Only working group teachers had their students fill out the survey.

Physical Facilities Inventory

During a first series of field visits in July, 1995, a physical inventory and preliminary walk-through of each school was conducted; a general assessment of the major building systems and functional components were conducted. In addition, preliminary interviews with the principal and the head custodian were conducted to augment the walk-through observations and physical facilities inventory.

Observations, Interviews and Surveys

During the second series of field visits in September, 1995, a full day of observation was conducted within each school which included behavior mapping, informal and formal interviews with teachers and photographic documentation of the school-in-use (See Appendix D: Case Studies for a full description of each case).

Principals, the head custodians, working group teachers and parent liaisons and volunteers were interviewed in each school. In addition, during observations, some teachers offered informal interviews to the observer. On average between 6-8 occupants of each school were directly interviewed.

Each teacher was asked to fill out a teacher survey-worksheet, as well as to administer a student survey. The number of potential students participating in the study through the survey averaged three classes of approximately 32 for a total of 96 total students.

Workshops

Prior to the third set of field visits in October, 1995, information gathered previously was tallied and organized into a series of potential environmental quality issues to be discussed during the workshop (See Appendix B: Environmental Quality Issues). Workshop materials included a list of all issues, floor plans showing the location of issues throughout the building, and a presentation board containing photographs of problem areas. Also included were individual issue cards and a blank matrix worksheet for ranking issues by priority (high, moderate, low, none) and the potential impact, if any, on one of three educational outcomes (Student Academic Performance, social development, Teacher Instructional Performance). The workshop, with a working group of four teachers and the assistant principal, lasted a total of 90 minutes.

Planning Workshops

A second and third workshop was conducted in December, 1995 and February, 1996, with School #142 who had requested further assistance in addressing some of the environmental quality concerns identified in the earlier workshop (See Appendix D, Case Study Report: Robert Coleman School #142). During these workshops, the group began to consider options for re-designing the layout of their open instructional areas. In addition, a planning and design workshop was conducted with the school's School Improvement Team in which various design options for new open plan configurations were discussed.

Summary of Findings

Presented here are across-case and between-case findings derived by aggregating data from the separate case study reports of each participating school.¹

Environmental Assessment Process

This study has found that when school occupants are engaged in an on-going environmental assessment process to identify and prioritize and address environmental quality concerns, issues and problems,

- they are able to go beyond "wish lists" to the formulation of the most critical environmental concerns affecting not only their own situation, but the situation of students and teachers in the entire school;
- they experience some psychological benefits in that they have been able to express their environmental concerns in a systematic manner that they perceive as leading to the potential for change; and,
- **participants experience increased environmental awareness and exhibit an increased environmental competence, an increased sense of control, as a by product of the environmental assessment process.**

¹ Each report, located in Appendix D, individually documents the environmental quality conditions at each of the five schools.

The process is observed to facilitate not only environmental assessment, but environmental change and action on the part of participating schools. Small but significant environmental improvements have been made in several schools in the study.

Finally, the environmental assessment process offers an extension of the existing School Improvement Team influence into the domain of facility management.

Environmental Concerns

As an outcome of the participatory environmental assessment process a set of environmental concerns surfaced:

- The number of environmental quality concerns ranged from 10 to 27, while the a subset of high priority issues ranged from 5 to 18.
- When environmental concerns are categorized by occupants as partially attributable to facility management, match schools experience as much as 18% more concerns than JCI-managed schools.
- **Further, when only high priority environmental concerns are considered that are categorized by occupants as partially attributable to facility management, match schools experience as much as 38% more concerns than JCI-managed schools.**
- Ironically, JCI-managed schools averaged more environmental concerns per school (20) than match schools (12). Considering that the schools chosen for the public-private partnership were identified by the District as some of the schools with the greatest need of assistance, this last statistic is not completely unexpected. In fact, the school with the most environmental concerns, not perceived by occupants as attributable to facility management was School #142 that did not have the assistance of EAI until later in the program.
- The corollary to these findings is that across all schools in the study, **two-thirds of environmental concerns are perceived by occupants to be either their own school's or their school district's responsibility to resolve or address.**

Participants' response to these environmental concerns -- some they have been acutely aware of prior to this assessment study -- is clearly limited by budgetary considerations. However, the significance of this finding is that it supports this study's premise that occupants should and can be actively engaged in the environmental assessment of their own school rather than relying solely on outside experts (as important as they can be in the process).

Student Environmental Perceptions

Students of selected teacher participants were asked to complete a short five-item survey of their favorite places in school for learning as well as what they liked and disliked about their classrooms in particular.

- When students were asked what was their favorite place in their school they mentioned (ranked most mentioned to least) the gym, classroom, computer lab, cafeteria, library, art and music.

- When students are asked what are fun places to learn in their schools they mentioned (ranked most mentioned to least) their classroom, gym, computer lab, library, art and music room and auditorium.

What students like about their classrooms:

- Students clearly enjoy the aesthetics and appearance of their school. They are very aware of the sensory stimulation of their classroom. It is also clear that they enjoy reading and math and using computers in class in addition to playing games. On the whole, students like their teachers and having their friends in class with them. In addition, they are aware of the orderliness and layout of their classroom.

What students do not like about their classrooms:

- **Students are keenly aware and most concerned about open space being too distracting.** What makes this finding most significant is that these occurrences represent student concerns in only three of the four schools participating. This problem is high on teacher's list as well and reinforces their concerns.
- **Students are also preoccupied with the misconduct of their fellow students that distracts them further from their work.** Noise from other classes accentuates this problem. In addition, many students do not like learning in a messy classroom.
- **Of the remainder of reasons why students do not like their classrooms, the most striking is that thermal comfort issues were rarely mentioned.** This is the exact opposite finding from the perceptions of teachers who ranked physical comfort and health issues as their top priority.

Attributes of Environmental Quality

Environmental concerns were classified throughout the assessment process as belonging to a class of experientially distinguishable environmental quality attributes such as comfort issues, safety issues, adaptability issues, etc. When environmental concerns are categorized as attributes of quality and ranked, a reduced set of critical environmental qualities emerge.

Of the ten attributes of environmental quality distinguished by the working groups, five attributes (listed by rank) are perceived as representing the **highest priority environmental quality concerns** and the qualities they felt they had the least influence over:

1. **Physical Comfort & Health** refers to the degree to which occupants feel the indoor environment meets their physiological needs with respect to thermal and air quality, illumination, noise and odors.
2. **Classroom Adaptability** refers to the degree to which occupants feel that the physical classroom space can be adapted to different and desired educational activities and functions.
3. **Safety & Security** refers to the degree to which occupants feel the school building contributes to protecting occupants from harm, injury, or undue risk.
4. **Building Functionality** refers to the degree to which occupants feel the various places within the school building are functionally compatible with your school's educational programs and activities.

5. **Aesthetics & Appearance** refers to the degree to which occupants feel the school building is attractive and provoking.

Five additional attributes of environmental quality (listed by rank), were mentioned less often and not seen as causing many major concerns and which they had the most influence over:

6. **Personalization & Ownership** refers to the degree to which occupants feel the school building offers opportunities to create a personal and self-expressive environment and engender a sense of ownership.
7. **Places for Social Interaction (Social Places)** refers to the degree to which occupants feel that places within the school building provide opportunities for meaningful social exchange and interaction.
8. **Privacy** refers to the degree to which occupants feel that there are places within the school building which provide opportunities for an individual or a small group to be free from the intrusion of others.
9. **Sensory Stimulation** refers to the degree to which occupants feel the school building provides a stimulating environment for learning that is safe yet challenging.
10. **Crowding/Spaciousness** refers to the degree to which occupants feel the school building cannot adequately accommodate the number of students and teaching staff occupying it.

Links between Environmental Quality and Educational Processes & Outcomes

The study found that a decreasing number of high priority environmental quality concerns experienced by school occupants is significantly correlated with higher levels of student performance.

Specifically, when high priority issues expressed by the working groups in each school are correlated with an aggregated percentage of student academic improvement between 1993-1995², a significant relationship is observed ($r^2=.81$, $p=.01$). Although this study is exploratory, the sample of schools is small, and the correlation does not suggest a causal relationship, there does appear to be a general emerging pattern between environmental quality and educational outcomes.

To what degree the maintenance and improvement of environmental quality contributes overall to educational quality is unclear from this study. However, it is clear that environmental quality is perceived by the occupants of each school in the study as one of the critical indicators of educational quality along side the more familiar indicators as the school's social climate, student socio-economic background and the quality of the student's home and neighborhood environments.

In order to discover which specific environmental qualities might be linked to educational processes and outcomes, participants were asked to identify those environmental qualities that they perceived are having the greatest impact on various educational outcomes:

²As reported in the Maryland School Performance Program Report, 1995

- **Physical Comfort & Health and Classroom Adaptability** are the environmental quality attributes most often mentioned as having an affect on **Student Academic Performance**,
- **Physical Comfort & Health, Safety & Security, Personalization & Ownership** are the environmental quality attributes most often mentioned as having an influence on **Student Social Development**,
- **Physical Comfort & Health and Classroom Adaptability** are the environmental quality attributes most often mentioned as having an influence on **Teacher Instructional Performance**.

The Role of Facility Management in Supporting Educational Processes & Outcomes

An across case analysis reveals that facility management services are perceived by school occupants as having a critical role in both maintaining and improving several of the environmental qualities identified by working groups in the study.

- **Four out of the total of ten environmental qualities (Physical Comfort & Health, Safety & Security, Personalization & Ownership and Aesthetics & Appearance), are seen as being domains of facilities management, and concurrently domains that occupants experience less influence over.**

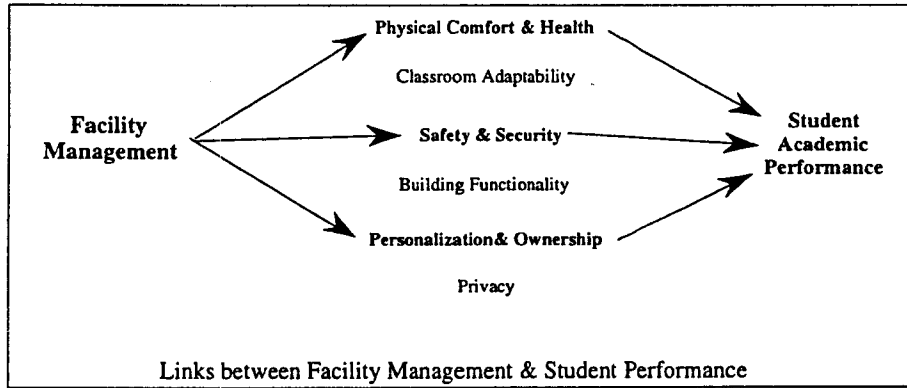
Between cases, on the other hand, the influence JCI-managed schools differs from match schools in the study.

- **JCI-managed schools have 24% less perceived environmental concerns adversely affecting educational outcomes than match schools.**

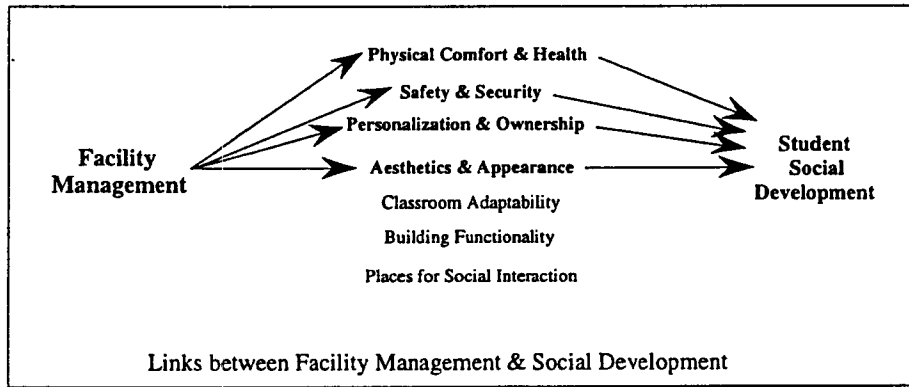
This suggests that JCI facility management is contributing to the educational process by creating a slightly more favorable physical environment than match schools.

Through these four environmental qualities, facility management is perceived by the working groups as having varying influence on Student Academic Performance, Student Social Development and Teacher Instructional Performance.

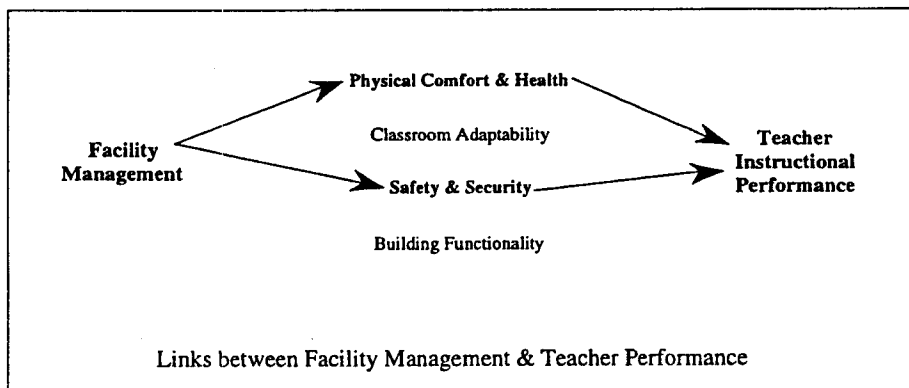
- Facility management was found to directly address three of the six environmental quality concerns identified as being most commonly associated with student performance: Physical Comfort & Health, Safety & Security, and Personalization & Ownership.



- Facility management was found to directly address four of the seven environmental quality concerns identified as being most commonly associated with Student Social Development: Physical Comfort & Health, Safety & Security, Personalization & Ownership and Aesthetics & Appearance



- Facility management was found to directly address two of the four environmental quality concerns identified as being most commonly associated with Teacher Instructional Performance: Physical Comfort & Health, Safety & Security.



Summary of Conclusions

- Many of the environmental concerns that schools confront can only be effectively addressed by educators themselves. Comprehensively identifying the many environmental concerns *from the perspective of educational activities and goals*, is not a collective skill many schools possess. However, all schools, through school improvement teams, have the capacity to deal with environmental concerns.
- The environmental assessment process can be a useful tool in uncovering environmental quality concerns that matter to parents, staff, teacher and administrators, and in so doing can be helpful in continuously improving the physical conditions of learning and teaching.
- Environmental quality is most often perceived by the five schools in the study as the provision of physical comfort and health, classroom adaptability, safety and security, building functionality and aesthetics and appearance.
- Where high priority environmental quality concerns are considered JCI-managed schools had less facility management related concerns than match schools.
- A number of these environmental qualities are perceived by occupants as having an impact on educational outcomes. To further strengthen occupant perceptions, high priority environmental concerns have been found to be significantly correlated with percent student academic improvement.
- The domain of facility management is perceived by occupants to include physical comfort and health, safety and security, personalization and ownership, and aesthetics and appearance. Facility management has, in effect, a 40% influence over environmental quality in the study schools, while occupants perceive themselves to influence the other 60%.
- By maintaining these four environmental qualities, facility management is additionally seen as having a role as well in supporting educational activities, goals and outcomes. Comparing schools, JCI-managed schools have been more effective in supporting educational activities than match schools.
- Although there are still problems that exist in each school, overall, occupants are satisfied with their custodial services. Custodial staff in JCI schools were consistently perceived by occupants as going beyond expectations, while at the same time increasing future expectations.
- Environmental qualities of classroom adaptability and building functionality are concerns neither educators nor facility management personnel have been able to appropriately address. Many functional problems that mix educational program and facility issues still remain in all five schools in the study.
- In order to address these remaining problems, educators must become more aware of the potentials and opportunities that the physical setting presents them, while facility managers need to become more cognizant of the role of the physical environment in supporting the educational process.
- In short, facility management can potentially increase their influence over the environmental quality in these schools by partnering with educational decision making processes and through increased participation of occupants in the environmental assessment of their own school.