Investigating the learning environment from users' perspective

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ABSTRACT: The educational process in schools involves many activities that ultimately aim at testing students' motivation, knowledge assimilation, academic performance, and teachers' productivity. How these activities are accommodated in a responsive environment is a critical issue that deserves special attention especially from users' perspective. This paper analyzes emerging understandings of learning environments. Reactions of teachers and students to classroom and cluster prototypes, among other aspects, against a number of spatial requirements and educational objectives are analyzed and discussed based on two mechanisms. The first is a comparative analysis of reactions of teachers from three elementary schools within Charlotte-Mecklenburg School District. The second part is a case study of a pre-design phase undertaken for redesigning some buildings of North Carolina School of the Arts. The results of this investigation support the assumption on how the school environment has a direct impact on the way in which teaching and learning takes place. A conclusion envisioning the need for going beyond adopting prescriptive measures to address the quality of the learning environment is conceived by highlighting the need to utilize knowledge generated from research findings into school design process, to pursue active roles in sensitizing users about the value of the school environment in reaching the desired academic performance while increasing teachers' productivity.

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INTRODUCTION

In recent years, education theorists voiced the opinion that all education reforms are worthless if children—our future generations—have to come to school in buildings that destroy their spirits, inhibit their creativity, or hinder their academic achievement (Duke 2002 & 2004; Tanner and Lackney 2006). The way in which we approach the planning, design, and ultimately our overall perception of learning environments makes powerful statements about how we view education. How school buildings are designed tells us much about how teaching and learning occur. Studies on classroom effectiveness indicate that there are significant differences in the amount of learning taking place in different classrooms within one school or in different schools. The educational process in schools involves a number of activities that supremely test students' motivation, academic performance, and teachers' productivity. How these activities are accommodated in a responsive environment is a critical issue that deserves special attention. While it has been said in the past that a good teacher can teach anywhere, a growing body of knowledge suggests a direct correlation between the physical aspects of the learning environment, teaching processes, and learning outcomes (Bosch 2002; Lackney 1999).

The literature developed over the past decade corroborates that school environments in different parts of the world are incapable of providing students and teachers with feelings of hospitality, welcoming, and safety (Bosch 2002; Bosch and Pearce 2003; Lackney 1994; Meek 1995; Sanoff 2001-a; Knapp, Noschis, and Pasalar 2007). They operate in environments that inhibit the educational process. Current views on planning and designing learning environments place emphasis on the development of standards and specifications that address what needs to be considered in a school building, but rarely address why and how! In essence, they address the final product—the learning environment itself—without giving enough attention to the process that leads to a good product. Design practices on the other hand do not address pedagogical objectives, teaching methods, or the needs of learners in a clear manner. Behavioral issues such as privacy, personal space, small group behavior, crowding and density are typically oversimplified. Therefore, it is paramount to examine a number of critical issues in school planning and design that foster the creation of learning environments conducive to learning. Duke's statement—a prominent contemporary educator—corresponds with this argument. He states and rightly so "to build or rebuild our schools without thinking the experiences that take place in them seems unwise. These experiences create opportunities to redesign both schools and schooling" (Duke 2004:11).

Framing up emerging understandings of learning environments, this paper critically analyzes current understandings of learning environments, while emphasizing that the physical environment of an educational building may enhance or hinder essential teaching and learning activities. Based on this analysis the paper calls for a fresh look at the learning environment from the users' perspective and the need for understanding the culture of the learning environment. It presents the results of investigating different aspects of learning environments by measuring reactions of teachers and students to classroom prototypes and cluster typologies, among other aspects, against a number of spatial requirements and educational and behavioral objectives. Such an investigation is carried out in two
parts: The first is a preliminary comparative analysis of responses of teachers from three elementary schools within Charlotte-Mecklenburg School District. The second part is a case study of a pre-design phase undertaken for designing and remodeling the buildings of North Carolina School of the Arts. The results of this investigation support the assumption on how the school environment has a direct impact on the way in which teaching and learning takes place. A conclusion envisioning the need for going beyond adopting prescriptive measures to address the quality of the learning environment is conceived by highlighting the need to utilize knowledge generated from research findings into school design process, to pursue active roles in sensitizing users about the value of the school environment in reaching the desired academic performance while increasing teachers’ productivity.

1. EMERGING UNDERSTANDINGS OF LEARNING ENVIRONMENTS

Over the past fifteen years there has been a worldwide surge in the design and construction of learning environments. This was coupled with a growing body of knowledge on how the physical environment may support teaching and learning processes. A number of new concepts were generated to respond to the changing needs of teachers and learners thereby establishing new understandings of the physical as well as the social aspects of the learning environment (Salama 2004). Such understandings can be categorized under several headings that articulate how schools and schooling are viewed today.

1.1. Schools within a school and the emergence of the academic house concept

The notion that increasing the size of schools was an important reform idea is fundamentally flawed. It has led to the emergence of mega schools throughout the world. Although it is believed that they are cost effective findings of recent research reveal that such environments discourage a sense of responsibility and meaningful engagement while students’ misconduct appear to be highly visible. Recent knowledge on the other hand suggests that smaller schools offer students greater opportunities to participate in extracurricular activities and to exercise leadership roles (Lackney 1994; Sanoff, 2002).

Paradigm shifts in thinking about school size can be seen in the academic house concept where the school community is divided into smaller academic houses or units acting as clusters and composed of a number of learning centers. The grouping of students and teachers into small interdisciplinary teams allows a sense of closeness to develop between them and enhances intellectual growth and academic performance while fostering emotional and social maturity (Bingler 1995). Clustering the school into academic houses is an innovative thinking in designing for mixed age groups, promoting positive interaction between children, allowing for indoor-outdoor integration, and ultimately creating a welcoming and aesthetically pleasing learning environment.

1.2. The school as a community hub

One of the important directions for education in the 21st century is to design the school as a community hub (Fiske 1991; Moore and Lackney 1995; Nair 2003). New schools are currently planned to reflect this concept (Sanoff 2002). Recreational centers and community libraries are functions that help achieve the integration of the school into community activities. Architecturally, the school may wrap the community functions. Schedules are developed so that everyone in the community can use the school building. Programs may include adult education classes, job training centers, social services, community clinics, and general facilities for the community. This encourages the use of the school year-round, saves resources, and creates a heart for the community. However, it mandates the rethinking of the school function and the school architectural program to accommodate this vision.

1.3. Emerging classroom typologies

The classroom is the setting in which education takes place. Traditionally, a standardized classroom plan was designed to maintain order and control a student behavior. Silence was encouraged in order to keep students more focused. The classroom was designed and spatially arranged to reflect this belief. At the beginning of the 20th century the bleacher-style seating and sloped floors was envisioned to aid the teacher’s supervision of the classroom. By the mid twenties rectangular classrooms had become universal. Studies on classroom effectiveness indicate that there are significant differences in the amount of learning taking place in different classrooms within a school and in different schools (Butin 2000; Sanoff 2001-b.).

It is critical for architects to recognize that not all children learn the same. With some children visual learning, such as printing or instructional films, has the greatest impact. Some students learn better through verbal and spoken words such as story telling, while others learn from kinesthetic or psychomotor activities such as acting, modeling, and constructing. Classrooms need to be designed to reflect a particular form of teaching behavior and to represent a teaching/learning process that achieves specific pedagogical objectives. Responsive architects and educators started to reconfigure classrooms into different typologies that invigorate educational and behavioral goals (Salama and Adams 2003-a & b). These include achieving a sense of identity and belonging, facilitating team teaching, working on small groups, and accommodating a spectrum of learning opportunities (Sanoff 2001-b.). In this respect, one should assert that architects need to develop comprehensive understanding of the wide range of prototypes and what impact they have on achieving desired educational outcomes.

1.4. The color of learning and the environment as a non-verbal message

The effect of the environment as a non verbal message has been an area of a growing concern (Duncanson, 2003). The use of classroom spaces, outdoors, and other group activity areas influence how students and children behave. The amount of space in a room conveys silent but powerful messages to its occupants. The messages that traditional classrooms deliver do not support inquiry based teaching and learning. Effective use of inquiry skills requires more open space than that provided in a traditional classroom setting. The human brain has two memory systems; one for
ordinary facts and the other for emotionally charged ones. However, both exist in a continual and interactional process. When children are emotionally upset they can not learn efficiently since the emotional part of their brains has overpowered the rational part. Color enhances the two memory systems in different ways. Color in the learning environment should not be dull or monotonous as it creates a sense of boredom for the learners. Children need colors that make them feel comfortable and that stimulate their cognitive abilities. Green, blue, and reddish-purple stimulate the brain and provide access to the student energy.

Julie Barrett, a learning specialist argues that red can provoke troubled students to become more anxious and argumentative. Light green and pale blue may calm an unruly student. Yellow tends to emphasize loyalty, honor, and truthfulness. Different colors stimulate different learning and mental activities such as excitement, alertness, creativity, reflection, relaxation…etc. Future designers need to carefully consider the impact of color on learning and on children behavior (Barrett, 2003). Rethinking the colors of walls, carpets, tiles, and furniture elements in classrooms, school libraries, media centers, hallways and outdoor pavements is urgently needed.

1.5 Community involvement: a user centered process

Addressing the needs and behaviors of those who occupy the learning environment in a school planning process requires that those who actually dwell in the space be part of the process. Many architects and scholars adopt this view. Decisions about learning environments are still made by a few that affect many. Henry Sanoff, Distinguished Emeritus Professor of Architecture at North Carolina State University argues that “not involving everyone can cripple the outcome for years to come” (Sanoff 2001-a). He has implemented this argument in many of the school design activities in which he collaborated. Involving the school community requires intensive and collaborative process. Such a process needs to be flexible to meet the requirements of different design situations. It often begins with interviews and walkthrough evaluation of the existing facility, establishing the stage for an initial workshop.

Participants working in small groups write wish poems of their needs and desires. Special workshops are conducted with children or students based on the school type; these allow them to voice their opinion about their new school. Next, teachers and administrators develop a dialogue that is facilitated by the design team and that involves a discussion of the educational objectives and the spaces required for accommodating teaching and learning activities. A follow up design workshop and a site walkthrough are conducted to explore options and design concepts while discovering the site constraints and realities. In these workshops, the basic organization of the site and the school building are explored and discussed with consensus arrived at about the future direction to be pursued.

2. THE NEED FOR RE-CONCEIVING THE CULTURE OF THE LEARNING ENVIRONMENT

The emerging understandings of learning environments represent many of the dynamics of how teaching/learning occurs. They manifest a cultural shift in terms of the way in which the learning environment is now comprehended by both architects and education theorists. Successful designing of learning environments can be achieved when designers recognize the nature of a school culture and its dynamics. In this respect, one can argue that culture is maintained in schools through a process by which formal and informal learning is integrated where socialization and interaction between teachers and students occur.

Oversimplifying the importance of a school culture is usually associated with a lack of understanding of the dynamics that characterize the learning environment, and an assumption that culture is unimportant (Sanoff 2001-b.; Trimble 1986). In order to overcome this view architects and decision makers should have an understanding of how culture is formed, how it influences thinking and behavior, how it can be transformed, and then what environment is needed to accommodate that culture. The question that can be raised at this point is what constitutes the culture of the learning environment? And how such a culture can be addressed?

There are many factors that contribute to how the culture of the learning environment is shaped. They include the physical and social context in which it operates, its history, and the way in which it is managed and supported. However, based on the preceding outline of emerging understandings of learning environments, one can assert that the most important factors would relate to users expectations of what should or should not happen, how they comprehend their environment, adapt it, react to it, how they sustain their educational beliefs and standards, and how they conceive the role their physical environment may play to support required teaching and learning activities. In essence, this suggests that there is a need to continuously get feedback on how these environments work, especially from the users' perspective, teachers and students. Such a need can be satisfied by exploratory investigation and collaborative processes through which the learning environment is demystified based on the perspective of those who use it.

3. TEACHERS' REACTIONS TO CLASSROOM PROTOTYPES

Based on the classroom arrangement rating scale that was developed by Henry Sanoff in 1995 and 2002 and was implemented by the Adams Group Architects in several collaborative design processes (Salama and Adams 2003-b), an exploratory investigation process was devised to get reactions from teachers of three elementary schools in Charlotte Mecklenburg School District, North Carolina. Six classroom prototypes and five classroom cluster arrangements were examined and analytically compared against a number of spatial requirements and educational objectives (Fig. 1-a & b). Such requirements and objectives reflect the emerging understandings of learning environments and the need for understanding a school culture. The three schools selected to conduct this investigation were Old providence, Myers Park, and Carmel Christian elementary schools. They were selected to
represent different contexts where Old Providence is a newly designed and built school in southern Charlotte, Myers Park is housed in a historical building in a historic neighborhood that was undergoing intensive renovation and expansion, and Carmel Christian is a new private school of a Church organization in the suburbs of Charlotte.

a. Classroom arrangement rating scale

Source: (Adapted from H. Sanoff 1995 and 2002)

Figure 1: Examining classroom and cluster prototypes against spatial requirements and educational objectives

4. STUDENTS REACTIONS TO THEIR FUTURE ENVIRONMENT

In a collaborative pre-design process undertaken by the author among other team members at the Adams Group Architects that was developed in 2003 and 2004 as part of renovating, remodeling, and designing new buildings at North Carolina School of the Arts two major sessions were conducted. The overall purpose of these sessions was to develop an understanding of how students conceive the future of their school and to examine a number of aspects included in the scope of work (Fig 2-a & b). The first session involved investigating students' reactions to classroom and cluster prototypes to be utilized in the remodeling of classroom buildings.

a. Image preferences sheet utilized in a session with students

Source: (The Author, 2003)

Figure 2: Examining NCSA students' reactions to their future environment

b. Yard preferences sheet utilized in a session with students

Source: (The Author, 2003)
The second session involved a structured discussion on their preferences of the image of a dance studio that was conceived as a new building to be introduced in the project site. It also encompassed comprehending their preferences of the future yard/breezeway located between the new and existing buildings (Fig 3).

![Image of NCSA students in a session to discuss the future of their school](source: (The Author))

**Figure 3: NCSA students in a session to discuss the future of their school**

### 5. ANALYSIS AND DISCUSSION OF MAJOR FINDINGS

While teachers’ reactions to classroom arrangement rating scale vary dramatically, it appears that there were certain preferences of some classroom arrangement types over others. Teachers reacted to prototypes 2 and 3 as having the most positive features that pertain to meeting spatial requirements while invigorating the achievement of educational objectives (Fig. 4). Notably, classroom prototype 2 received 11, 26, and 13 positive reactions from Old Providence, Myers Park, and Carmel Christian respectively. The second highest number of positive reactions from teachers was given to prototype 3 by the teachers in this sequence Old Providence (34), Myers Park (9), and Carmel Christian (9).

Evidently, prototype 2 was most preferred by Myers Park teachers as it offers a resource and teacher work area in the middle of a cluster of four classrooms. The idea that classrooms are accessed only from the work area seems to be favored by the teachers as it allows for easy control over children movement and easy supervision. On the other hand, prototype 3 was most preferred by Old Providence school teachers as it offers an L-shaped spatial organization that facilitates the presence of several learning activities at the same time. However, some teachers noted that prototype 3 was misleading because it appeared larger in area than all other prototypes. As well, few teachers noted that the way in which it is organized requires the presence of the teacher’s assistant all the time in class. While there are some similarities between prototypes 3 and 4, only 4 positive reactions were given to prototype 4 as it appeared smaller significantly. Strikingly, prototypes 1 and 6 were given few positive responses only by Carmel School teachers.

![Diagram of classroom arrangements](source: (The Author))

**Figure 4: Comparative analysis of teachers’ reactions to classroom arrangement rating scale**
Examining classroom cluster typology reveals that the staggered-single loaded type was the most preferred by the teachers of the three schools where 26 out of 41 teachers associated such a type with the best arrangement that allows for mixed age groups. The enclosed-single loaded was the second preference where 25 teachers associated such a type with the best arrangement that allows for indoor-outdoor integration while achieving the most welcoming entrance. The linear-double loaded type was not associated with any positive aspect stated in the classroom typology sheet (Fig. 1-b).

Discussions with NCSA students in the first session reveals responses to classroom arrangement rating scale different from that from that of teachers of the three elementary schools. Prototype 3, the L-shaped arrangement was the most preferred by the students where 29 out of 35 associated it with aspects that pertain to having sufficient opportunities to move around, variety of seating arrangements, and students and teachers can make quick transition from one activity to another. Unlike teachers, students have not commented on the issue of the relative classroom size and thus prototype 4 was the second preferred arrangement favored where 28 students were associated it with aspects related to small groups working independently on different activities or projects while having a sense of identity and belonging. Prototypes 1 and 6 were not associated with any positive aspect stated in classroom arrangement rating scale (Fig. 1-a).

The exploration of a best fit image of a dance studio reveals that images B and F (Fig. 2-a) are seen as equal by the majority of students and are regarded as the best images that reflect a unique identity for a dance studio at NCSA. Students commented that both images introduce "something new" in a traditional campus image while at the same time are not in conflict with the existing buildings. Image C appears to be the most disliked by the students as 30 out of 35 students commented that the building may look pleasing on its own, but it looks odd in terms of colors and textures when compared with the surrounding buildings. While image A relates to the context almost all students did not like it as they felt it does not express a dance studio and looks like a typical traditional classroom building.

In discussing the breezeway or the pedestrian street between buildings all students agreed that colors, natural plants, sculpture and art works are critical aspects needed when re-designing any outdoor space on campus. The majority of students could not understand the meaning of flexibility. However, when the term was explained to them in physical terms the majority felt the value of having variety of arrangements that are adjustable and adaptable to changing outdoor learning and recreational activities.

The preceding analysis suggests that the learning environment is viewed differently by different users groups and within one group based on their past experiences, backgrounds, needs, and roles they play within the environment. For teachers, their reactions are based on how they view education and the physical environment in which they believe they can be more productive. Moreover, they have reacted differently based on their understanding of how a classroom arrangement or a cluster prototype may foster the achievement of the educational program adopted within the school. On the other hand, the consensus witnessed among the students in viewing how their future environment may be shaped reflects some form of dissatisfaction with their existing environment. It also highlights collective aspirations on how the reshaping of the existing environment and the introduction of new buildings may take place.

CONCLUSION: PROLOGUE FOR THE FUTURE OF LEARNING ENVIRONMENTS

The objective of this paper was to suggest mechanisms by which architects can develop a comprehensive understanding of learning environments from users' perspective. Based on a critical analysis of recent conceptions and emerging understandings of learning environments an investigation of users' reactions to a number of aspects was undertaken. It included an examination of classroom prototypes, cluster typologies, image making and outdoor environment. The results reveal that the learning environment is viewed differently by different users groups and within one group based on their past experiences, backgrounds, needs, and roles they play within the environment. Whether teachers or students, reactions reflect the dynamics of the learning environment and how it needs to be viewed from the perspective of those who actually use it. Their insight is believed to be indispensable toward a deeper insight into how the environment can support learning and can invigorate the achievement of desired educational objectives. While such results are qualitative in nature, they provide a base for important future considerations when investigating, introducing change in existing environments, or designing new environments. Such a base can be articulated in two different but related issues which are outlined hereunder.

From guidance documents to users awareness and feedback

Current practices for creating learning environments involve two major approaches: top-down and bottom-up. The top-down approach refers to initiatives led by the authorities or decision makers. It aims at developing policies, strategies, and standards. However, this approach was heavily accused of being more evaluative than informative, and that it relies on forcing the professional community to be aware of an issue then responding to it. The bottom-up approach refers to initiatives led by the community and facilitated by professionals. It aims at building public and professional awareness, while providing feedback mechanisms. It is more informative than evaluative and relies heavily on developing a common understanding, a common language, and develops a sense of responsibility toward the environment (Salama, 2002, 2003). The top-down approach is generally adopted and emphasized in the form of guidance documents while the bottom-up approach is over simplified. Two questions can be raised here: "Have the guidelines been transformed into real practices?" And, "why do we not find as many examples of responsive learning environments as we find this accumulation of knowledge developed in the last few years?"

Typically, guidelines introduce technical measures and recommendations. They encapsulate the best building practices that address the professional community. However, they are always rough, mainly addressing quantitative
aspects. Guidelines are always generic and do not address a specific context or specific user group. Some scholars believe that by developing guidelines socially and environmentally responsive learning environments can be realized. In this respect, one can assert that no guidelines are ever final; they evolve over time according to the changing circumstances. Therefore, they have to be strategically developed to respond to emerging needs and to the nature of the users. In fact, they do not provide blue prints on how responsive environments can be developed, only an expectation about the good picture of what the future might be. The bottom-up approach that emphasizes users’ awareness and involvement was also criticized in terms of time consumption. Some argue that time invested in training programs and awareness campaigns is excessive. Although recent literature corroborates that the results are far reaching, some scholars argue the process consumes considerable time while developing positive attitudes toward the environment and reconfiguring the culture of sustainable building management and operation.

The preceding understanding suggests that while emphasis has been placed on the top-down approach to design learning environments, the bottom-up approach has been oversimplified or ignored. In this regard, it is believed that both approaches are needed and none of them can replace the other. Mechanisms such as those presented in this paper may support effective bottom-up strategies for creating learning environment.

**From intuition and intrinsic feelings to evidence based design**

The architecture of learning environments in many cases makes little reference to anything but the creative impulses of the architect who tends to adopt this view: I am human, I am designing for humans, then why can’t I be the model for what all other human beings need in the built environment? (Sanoff 1995). This is completely contrary to the ethical and social responsibility of architecture as a profession. Designers of learning environments do not particularly look forward nor have an interest in seeing the advantage of developing detailed knowledge about users, teachers and students as resources for design except when functional programmatic standards are at the forefront. In typical practices for designing learning environments it is generally accepted that it is generally accepted that good environments results from inspired thinking and doing where cultural sensitivity, technical skill, and intuitive understanding are creatively interwoven in the architect’s personal synthesis. Typically, users enter such a synthesis in the form of the designer’s own experiences. In this respect, it should be emphasized that creating learning environments resulting from the users experiencing them is crucial. The recognition of how the users of learning environments perceive, comprehend, and animate these environments is what creates responsive buildings amenable to students’ motivation and good academic performance and teachers’ productivity.

Among the challenges facing designers of learning environments is a growing interest in evidence-based design. While the mechanisms adopted in this paper may help satisfy this interest partially, examining the literature cited in this paper and elsewhere reveals that evidence-based design is a “rigorous, hypothesis-testing” approach to design practice that builds on a literature of user-oriented building evaluation research, namely post occupancy evaluation. Bringing the authority of some form of investigation or scientific method into designing learning environments should be a priority. A designer’s desire to lend the authority of investigating teachers and users needs to the art and pragmatics of educational buildings is now receiving considerable attention. A school district’s desire for greater accountability with less uncertainty needs to be incorporated into collaborative and research processes for understanding users’ needs. Design conventions that evolve through empirical evaluation and reactions of users of learning environments are likely to be better—and any approach that welcomes users based research into design practice is promising. The mechanisms presented in the context of this paper presents a dramatic departure from current practices to placing more emphasis on the value of creating awareness and getting feedback from current and future users of learning environment, while attempting to develop evidence to be utilized. Future architects need to continuously investigate the impact of the environment on learning, to utilize knowledge generated from research findings into school design, to pursue active roles in sensitizing clients and users about the value of the school environment in achieving outstanding academic performance and in increasing teachers’ productivity. They need to be able to involve representatives of the school community in making decisions about the future learning environment. Doing so requires new roles and new skills that go beyond the capacity of traditional architects.

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**REFERENCES**


